Welding Engineer

PRICE 50 CENTS

SEPTEMBER, 1955

PHOTO – COURTESY OF
NOOTER CORPORATION
ST. LOUIS, MISSOURI

Where the Weld is *the Heart of the Job* –

you have to be sure all joints are secure against invisible defects — and that calls for an electrode holder designed to get into tight places, with unvarying rod grip sureness. That's why **HI-AMP** Electrode Holders are preferred by so many fabricating and structural supervisors. Yes, you'll invariably find all **HI-AMP** Welding Products are employed wherever welding is a vital part of any operation. Sold only through Welding Supply Distributors in the U.S. and Canada.

WAGNER MANUFACTURING CO., *inc.* JACKSON, MISSOURI

Weld with Wagner

PRODUCTION WELDING
Oil Resistant Jacket
(Built Like Tire Tread)
HEAVY INDUSTRIAL WELDMENT
SHIPYARD WELDING
Can't-Slip
BELDEN NON-SLIP JACKET
DOES NOT SHRINK FROM ELECTRODE HOLDER
REPAIR SHOP
BRIDGE WELDING
FIELD CONSTRUCTION
Long Flex Life
No individual copper strand is ever under tension Withstands over 50,000 flexes
WELDING CABLE
by Belden
WIREMAKER FOR INDUSTRY SINCE 1902
1-18

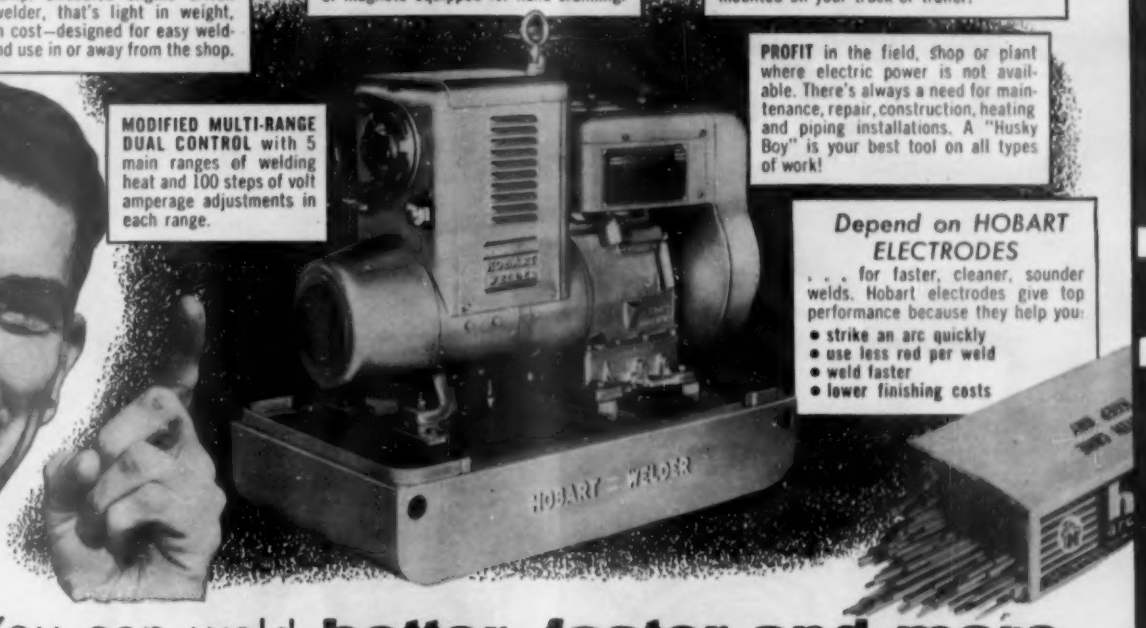
THE LOW COST "HUSKY BOY" . . . 200 amp. aircooled engine driven arc welder, that's light in weight, low in cost—designed for easy welding and use in or away from the shop.

RUGGED, DEPENDABLE OPERATION. Powered by a 2 cylinder industrial aircooled engine with push button starting, or magneto equipped for hand cranking.

WELDS ANYWHERE due to its light weight and compact design. Two or three wheel portable mountings available. Can also be mounted on your truck or trailer.

PROFIT in the field, shop or plant where electric power is not available. There's always a need for maintenance, repair, construction, heating and piping installations. A "Husky Boy" is your best tool on all types of work!

MODIFIED MULTI-RANGE DUAL CONTROL with 5 main ranges of welding heat and 100 steps of volt amperage adjustments in each range.



Depend on HOBART ELECTRODES

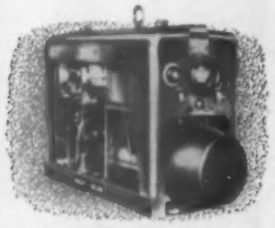
. . . for faster, cleaner, sounder welds. Hobart electrodes give top performance because they help you:

- strike an arc quickly
- use less rod per weld
- weld faster
- lower finishing costs

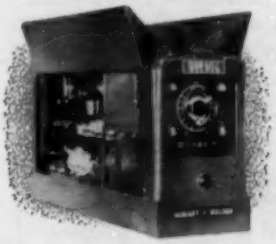
You can weld **better, faster and more profitably** with a HOBART WELDER

. . . because a Hobart Welder gives you rugged, heavy duty construction, long life, trouble-free service and extra capacity. In addition, you get famous Hobart convenience features: modified multi-range dual control and auxiliary power outlets that let you operate lights and tools.

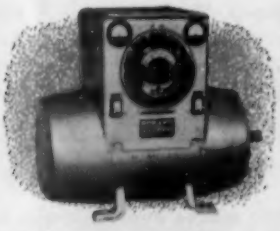
Space limits us from showing you our complete line, so simply check the type welder you're interested in, and send this page to us with your name and address. You will promptly receive complete information—without obligation, showing how you can profit when you choose a Hobart.



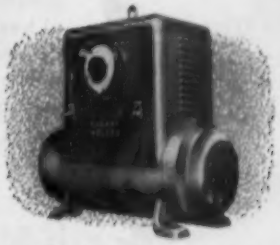
"CONTRACTORS SPECIAL"—a 250 amp. Gas Drive model that's light and compact . . . yet has plenty of engine power and a hot, fast dependable arc.



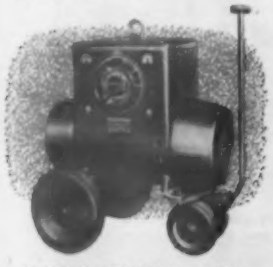
GAS DRIVE WELDERS with 1, 3, or 12 KW auxiliary power. 200 to 600 amp. models for speedy, low cost welding in the field where electric power is not available.



GENERATOR ONLY 200 or 300 amp. with 1 KW 110 volt DC power outlet for "Building-Your-Own" Gas Engine Welder. Has Hobart Multi-Range Control. Simply connect it to your power source.

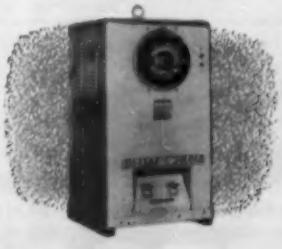


"BANTAM CHAMP" 250 amp. welder specially designed for light to medium requirements. A popular model for all fabrication purposes in the 200 to 250 amp. class.

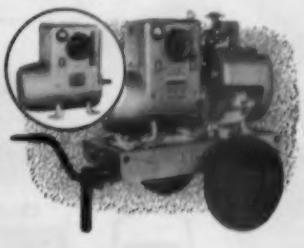


ELECTRIC DRIVE 300 and 400 amp. welders ideal for production, maintenance and repair service. Conservative rating lets you do heavy duty welding for limited periods of time.

DC RECTIFIER 300 amp. Has three Delta connected transformers, one for each phase . . . a magnetic line switch . . . overload protection on both rectifier and transformer plus remote control.



TRANSFORMER WELDERS 180 to 500 amp. models for shops that have only single phase power available. These models are liked by operators because they start fast and hold a stable arc.



AC POWER-AC WELDER 200 or 300 amp. Popular for general service welding where power is unavailable, or for operating tools, lights, etc. Available with 2 cylinder aircooled engine and portable mountings, or as a generator only for building your own unit.

HOBART BROTHERS COMPANY

"One of the world's largest builders of arc welders and arc welding equipment"

Box U-95, Troy, Ohio, Phone 21223

check the welder—tear out page and mail to

NAME

ADDRESS

CITY STATE

HOBART arc welders

CESCO RIGHT... before your Eyes!

GOGGLES for Every Weldor

No. 545-W Cup-Type

• Perfectly shaped for continuous, comfortable wearing. Brown thermoplastic cups have large contact area. Adjustable nosebridge and choice of headbands. Shielded ventilation ports. Screw type retaining rings for quick lens replacement.

No. 548-W Cover-Type

• New and larger to fit comfortably over larger personal glasses. Sturdy plastic cups are designed to bear around large face area. Adjustable nosebridge. COMFORT-KING headband. Shielded ventilation ports. Screw type lens replacement.

Other CESCO Goggles

• CESCO makes every popular kind of weldors' goggles including spectacle-type. You have a choice of lenses including CESCOWELD and SUPER-SAFETY. Every one is a quality product backed by many years of pioneering and field testing. When you buy CESCO safety equipment you know that it is *Right...before your Eyes!*

Send TODAY
for CESCO literature and the name of your CESCO safety equipment distributor

CHICAGO EYE SHIELD COMPANY · 2330 Warren Boulevard, Chicago 12, Illinois

CESCO FOR SAFETY

OFFICES IN: Atlanta, Birmingham, Boston, Buffalo, Cincinnati, Cleveland, Columbus, Dallas, Detroit, East Orange, Houston, Indianapolis, Kansas City, Knoxville, Little Rock, Los Angeles, Mexico City D. F., Milwaukee, Montreal, Peoria, Philadelphia, Pittsburgh, Salt Lake City, San Francisco, Spokane, St. Louis, St. Paul, Toledo, Tulsa, Wichita

Welding Engineer

SEPTEMBER, 1955
Vol. 40—No. 9

A MAGAZINE OF JOINING AND SEVERING OF METALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

Copyright 1955 by
WELDING ENGINEER PUBLICATIONS, INC.

12 East Grand Avenue
Chicago 11, Illinois
Telephone: DElaware 7-0339

TED B. JEFFERSON
Editor and Publisher

FELIX T. TANCULA
Executive Editor

JACK FAIRLIE
B. M. BRITE
AUDREY L. MADSEN
Assistant Editors

JOYCE C. NEVIS, *Production*

JIM BREWSTER, *Circulation*

WARREN WARE
Western District Manager
12 E. Grand Ave., Chicago 11, Ill.
Telephone: DElaware 7-0339

HERMAN PHELPS
Eastern District Manager
P. O. Box 128, White Plains, N. Y.
Telephone: WHite Plains 9-3876

MEMBER
American Welding Society
International Acetylene Association
Compressed Gas Association
National Welding Supply Association
Associated Business Publications
Audit Bureau of Circulations

Single copies 50 cents. Subscription rates: United States and possessions $3 per year; $4 for two years; $5 for three years. Canada $5 per year; $8 for two years; $10 for three years. All other countries $15 per year; $25 for two years; $30 for three years. Position and company affiliation must be indicated on subscription form. Allow one month for change of address.

Entered as second class matter Aug. 23, 1948, at the Post Office at Chicago, Ill., under Act of March 3, 1879. Printed in U. S. A.

WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

OPERATION

The lady is a welder 17
Welding repairs in radioactive areas 18
E. B. La Velle and J. M. Fox, Jr.
Aluminum vs. copper welding cable:
The case for aluminum 21
Ray Townsend

FABRICATION

1955 Ford bodies have a multitude of welds 32
Big savings in silver brazing 52
John B. Hill, Jr.

CONSTRUCTION

$150,000 welded wonder 30
F. T. Tancula
842-ft TV tower has welded strength 40
Welded scaffold lets patient resume job 63

INSPECTION

X-ray units go to the welds 29

MAINTENANCE

A newspaper needs welding "in a hurry" 24
Jack Fairlie
Braze-welding rods are all-purpose tools 26
Joseph Imperati
The care and feeding of cold chisels 34
Willis G. Groth
400% more life added to grinding hammers 59

DEPARTMENTS

News 5
Letters to the editor 8
Editorial: Doing anything—good? 15
The welding clinic: Basic metallurgy for welders 44
Data Sheet No. 180: Inert gas flow nomograph 47
On the job 56
New products 66
People 87
30 years ago 92
Patents 93
Advertisers in this issue 94
Where to buy 94
The Welding Shopper 95
Free literature 96
Welding Info-Aids 97
Literature offered in ads 98

New SUPERGOGGLES by Jackson

They're *wider* to allow plenty of inside room for good fit and free up and down movement where today's larger (never wider than 5 11/16") prescription and safety spectacles are worn.

They're also *deeper*, to clear the bridge of "horn-rimmed" glasses, somewhat deeper along the temples to afford greater side protection to the eyes, without being bulky.

This width and depth, added only where needed, gives an 18% greater, well ventilated inside area, making the Supergoggles also more comfortable, cooler to wear.

Eye cups are of strong plastic, non-conductive, non-irritating. A large, screen covered vent in each cup prevents fogging. Cups are joined by a metal bar, flexible enough to fit the goggles individually, rigid enough for one-hand positioning. A large leather pad closes in softly around the nose. Lenses, held by threaded plastic retaining rings, are replaced without tools.

Series '70'

For Gas Welding, Flame Cutting & Brazing, types W-70 and WR-70 have 50 mm. lenses, shades 3 thru 6. Baffle plates over vent screens exclude light, flying particles.

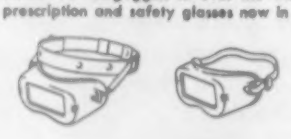
For Chipping and Grinding, types G-70 and GR-70 have 50 mm. clear, hardened lenses.

Elastic Headband holds WR-70, GR-70.

Plastic Headrest holds types W-70 and G-70 more firmly. Extruded plastic, impregnable to moisture, holds its shape, is easy to sterilize. Positive locking adjustment has clearly marked hat sizes. Cork-padded sweatband is easy, inexpensive to replace. Adjustable springs, in telescopic arms, hold goggles gently against face.

Series '50' Goggles fit over narrow-frame prescription glasses and safety spectacles

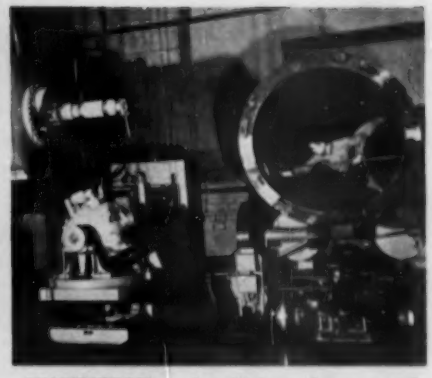
Series '60' Unigoggles fit over the widest prescription and safety glasses now in use



JACKSON
PRODUCTS, INC.
WARREN · MICHIGAN

Sold World-Wide—through Distributors and Dealers

MEMBERS of newly formed Baltimore welding association are from left: Bob Donovan, Harris Calorific Sales Co.; Milt Phelps, Arundel Sales & Service Co.; Fred Blenckstone, Baltimore Oxygen Supply Co.; W. C. Landrum, Earlbeck & Landrum, Inc.; Harry Fountain, Welders Supply Co.; Dick Carlin, Chesapeake Welding Supply Co.; A. C. Earlbeck, Earlbeck & Landrum, Inc.; Andy Axtell, Essex Welding Equipment Co., guest speaker; Harry Weaver and Fred Gaebler, Prest-O-Baltimore Co.; Clyde Adams, Southern Oxygen Co.; Randy Cooke, Arundel Sales & Service Co.; L. H. Matthews, Guilford Welding Supply Co.



INSPECTION tool, which makes use of radioactive Cobalt 60, is capable of radiographing or "seeing through" steel up to 7 in. thick. It is here shown examining the thick steel walls of a typical pressure vessel. Developed by The Babcock & Wilcox Co., Barberton, Ohio, the tool is called the "Isoscope." It needs only 1/3 the exposure time of a million volt X-ray unit

News

Welding supply association formed in Baltimore

The Baltimore Welding Supply Association, Inc., was recently formed at a meeting held at the Park Plaza Hotel, Baltimore. Speaker of the meeting was A. C. Axtell, Essex Welding Equipment Co., Newark, N. J., and vice-president of the National Welding Supply Association.

Officers elected were: A. C. Earlbeck, Earlbeck & Landrum, Inc., president; L. H. Matthews, Guilford Welding Supply Co., vice-president; W. C. Landrum, Earlbeck & Landrum, Inc., secretary; Fred Gaebler, Prest-O-Baltimore Co., treasurer. Fred Blenckstone, Baltimore Oxygen Supply Co., Randy Cooke, Arundel Sales & Service Co., and Harry Fountain, Welders Supply Co., were elected directors.

The association gave as its objectives: to encourage cooperation among distributors, inspire observance of good business methods, promote recognition of the distributor as an essential link in the distribution system.

* * *

Liquid Air opens two Canadian plants

Two oxygen and nitrogen producing plants recently began operation in British Columbia. The plants, owned by Canadian Liquid Air Co., Ltd., Montreal, are located at Victoria and Kitimat (See WELDING ENGINEER, April, 1955, "Maintenance at Kitimat-Kemano"). They bring the number of such plants in British Columbia to a total of seven and represent a $500,000 expansion of Liquid Air's manufacturing and distributing facilities.

The two new plants will also serve as distribution centers for the firm's industrial and medical gases, welding equipment and supplies.

* * *

Welding firm formed in Ohio

A new manufacturing company, known as World Electric Co., with engineering and sales offices in Cleveland Heights, Ohio, has been formed by Willard (Curley) Gunzelman. Mr. Gunzelman has been closely associated with engineering and fabrication of welding equipment.

The firm will market a complete line of equipment carrying the "Welco" trade mark. Engineering, servicing and consultation services for all types of welding operations will be included. World Electric also represents Banner Mfg. Co., Milwaukee, for its spot, projection and seam welders, and Harnischfeger Corp., Milwaukee, for its line of welding positioners.

Buffalo Welding Supply purchased by employees

Assets of the Buffalo Welding Supply Co., Buffalo, N. Y., have been purchased by former employees. Incorporating under the name of Buffalo Welding Supply Co., Inc., the new owners and officers are: Paul E. Gardner, president; John C. May, vice-president; Robert P. Stevens, secretary-treasurer. The firm will continue distribution of welding and safety equipment and supplies to the western New York area.

* * *

Hydraulics conference sponsored by Vickers

A Fabricating Machinery Hydraulic Conference was held recently at the Hotel Statler, Detroit, under the sponsorship of Vickers Inc., Detroit. Highlighting the meeting were discussions of standardization of hydraulic components, new fire-resistant fluids and design of leakproof connections for hydraulically actuated equipment, including hydraulic welding applications.

* * *

Westinghouse forms industrial heating division

Westinghouse Electric Corp., Pittsburgh, recently formed an industrial heating division with headquarters at Meadville, Pa. The new unit combines functions of the company's induction-heating activities, located at Baltimore, Md., and the industrial heating department, located at Meadville. L. R. Hague has been named manager of the new division.

NEWS

from page 5

THIRD move since founding in 1947 provides larger quarters for Unique Turntable, positioning equipment firm

NEW center at Rahway, N. J., will include general office building, warehouse and expanded research facility

Unique Turntable moves to larger quarters

Unique Turntable & Equipment Corp., formerly at 1125 Irving Ave., Brooklyn, N. Y., recently moved into larger quarters at 122 Sumpter St. in the same city.

* * *

Dominion Bridge builds new plant in Toronto

A new plant has been built by the Ontario Div., Dominion Bridge Co. Equipped for heavy plate and tank work as well as all kinds of welded structures, the plant adds to the company's manufacturing facilities.

Located on a 56-acre tract at Jane St. and Trethewey Drive in North York Township, the new building contains about 57,000 sq ft of floor space. Known as "Dominion Bridge Co. Mount Dennis Plant," the new building has rolling facilities, a vertical boring mill, a burning machine, plus an electrified Cleveland "Tramrail" installation.

* * *

Acro Welder moves into new St. Paul quarters

Acro Welder Mfg. Co., St. Paul, has moved into larger quarters at 1719 W. St. Paul Ave. The firm literally outgrew its space at 1825 W. St. Paul Ave.

The new one-story building (purchased from Bark River Culvert & Equipment Co.) has 13,500 sq ft of floor space. In addition, there is a truck-height loading platform, increased power supply, and a railroad loading spur. An engineering and drafting room is being added.

* * *

Distributors Association holds annual meeting

The annual meeting of the Independent Welding Distributors Association, Salinas, Calif., was recently held at Carmel by the Sea, Calif. W. V. (Doc) Raymond, president and general manager of California Welding Supply Co., Stockton, Calif., was elected president for the coming year. Otto Koll, proprietor of Welders Supply Service, Modesto, Calif., was elected vice-president and M. J. Andrews of Salinas, Calif., secretary-treasurer.

The IWDA is an association of 25 independent welding supply distributors in the Western United States, Alaska and Hawaii. The organization was formed in 1948 so that independent welding supply distributors might exchange information about business methods and trade practices. The next annual meeting will be held in San Diego, Calif.

* * *

Welding show held in Los Angeles

A welding show was held in Los Angeles by Harnischfeger Corp., Milwaukee, for its newly-appointed Southern California distributor, Absco Welding Supplies.

More than 500 persons saw live demonstrations of welding machines, positioners, and new welding applications. Milton Sims, president of Absco, was among the speakers.

Metal & Thermit to expand facilities

A combined general office, research and distribution center is under construction in Rahway, N. J., by Metal & Thermit Corp., New York City. Located on a 17-acre tract on Rahway Avenue, it is scheduled for completion in 1956.

The new center will include a general office building, a distribution warehouse and central steam plant as well as the company's existing research laboratory which is being expanded. The new center, when opened, will replace the firm's present warehouses and sales offices in Newark and Philadelphia.

The new office building, a two-story, 80-by-180-ft structure, will house approximately 200 general office employees. It will be of yellow brick construction and will be air-conditioned, contain a cafeteria and have ample parking space.

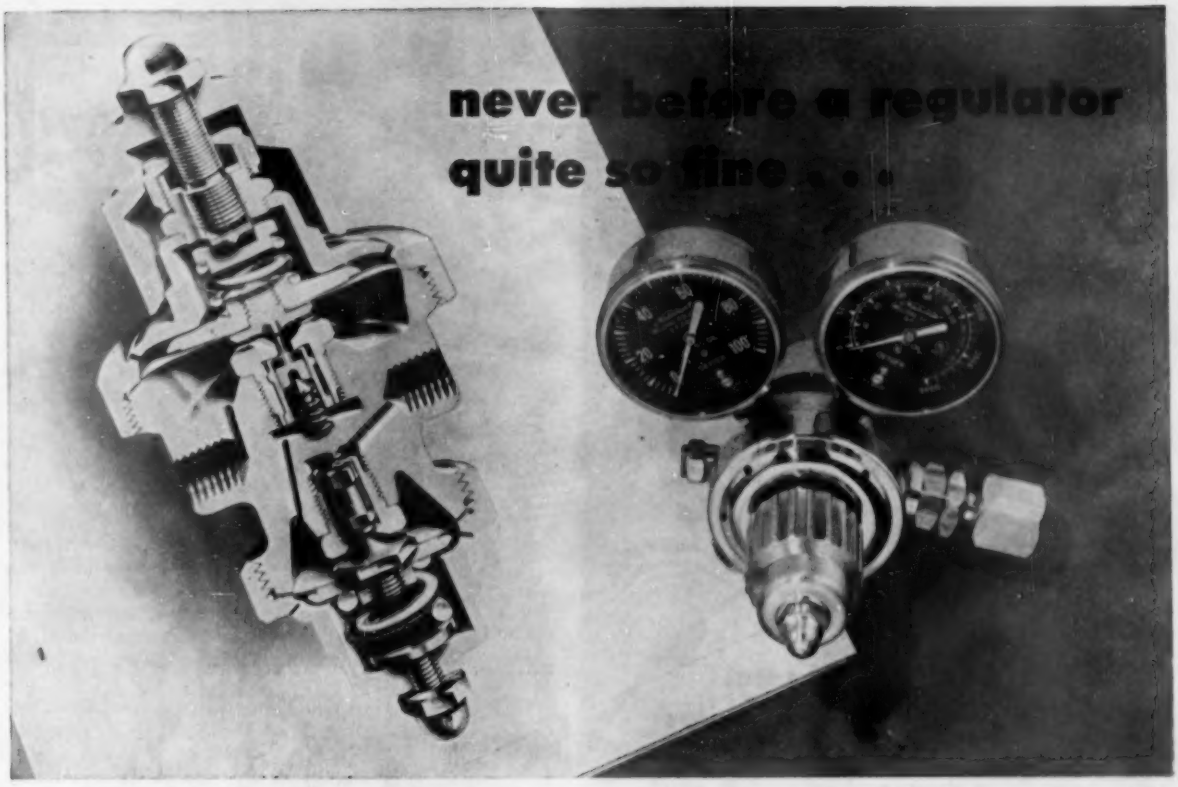
The warehouse building, a one-story structure of 10,000 sq ft will provide storage and distribution facilities for products of all Metal & Thermit divisions: welding materials, industrial chemicals, ceramic materials and plating and coating products of the United Chromium Division. Erection of the center was made necessary by expansion of the company's activities.

* * *

General Dynamics to study reactor technology

The Atomic Energy Commission has approved a study of reactor technology by General Dynamics Corp.,

(Continued on page 81)



would you like to know more about this important question . . .

how does a regulator work?

Your oxygen regulator tames a cylinder pressure which may exceed 2200 p. s. i.; it must do so consistently, reliably and safely.

Just how does so sensitive an instrument, so sturdy a regulator, work — what is pressure anyway — wherein lies the difference between a pressure gauge and a tubular flowmeter — when would you select a single and when a two-stage reduction regulator — and wherein lies their difference?

On what basis do you select a regulator to meet specific requirements of low or very high delivery pressures, or minute or very vast volume of flow?

If you have asked yourself these and similar questions about pressure, about the measuring of flow, about all of the many problems your regulator must solve for you, write for this new, FREE National regulator booklet today.

NATIONAL WELDING EQUIPMENT CO.
218 Fremont Street, San Francisco 5, Calif.
Please send FREE "Regulator" booklet.

NAME_____

POSITION_____

COMPANY_____

ADDRESS_____

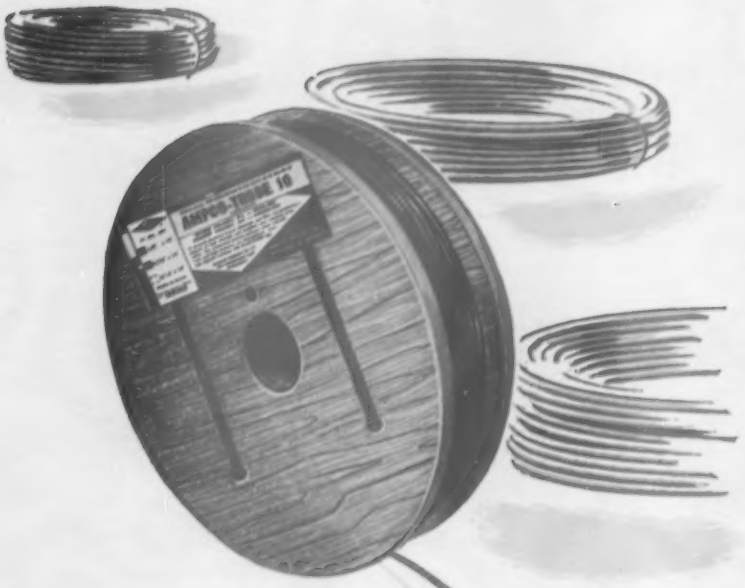
CITY_____ ZONE__ STATE_____

Please print to make sure you receive your copy.

National of ...california

NATIONAL welding equipment company... 218 fremont street san francisco 5 california

516



If you weld "difficult" metals with MIG consumable electrodes

you can do a faster, better job with

AMPCO-TRODE* 10
BARE WIRE

Here's versatile welding at its best. Ampco-Trode 10 Bare Wire, level-wound on spools or rims for the metal-arc, inert-gas process, gives you easy, high-strength, crack-free welds on aluminum bronze, silicon bronze, and manganese bronze. You also get clean, dense deposits on iron-base metals—cast and malleable iron, galvanized iron, and high alloy steels and irons. You can even make good welds joining one of these metals to another. And Ampco-Trode 10 Bare Wire is also ideal for wear- and corrosion-resistant overlays with hardnesses of 160-190 BHN.

You get more. Ampco-Trode 10 *pre-alloyed, solid wire* feeds better through the gun with fewer burn-backs. And the deposit is more uniform, giving you mechanical properties that are superior to "so-called" substitutes. That's why this versatile electrode can make a better product for you—at less cost. See your Ampco Weldrod Distributor.

*Reg. U. S. Pat. Off.

AMPCO

Sole producer of genuine Ampco Metal

AMPCO METAL, INC.

Dept. WE-9, Milwaukee 46, Wisconsin
West Coast Plant • Burbank, California

W-135

Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if you request it.

Welding attachment

Dear Sir:

We are interested in obtaining complete details of the new attachment for use with inert-gas-shielded welding torches and guns, developed by the Welding Laboratory of the U. S. Naval Engineering Experiment Station.

You mentioned this new device on page 82 of the April, 1955, issue of WELDING ENGINEER. We will appreciate your forwarding any available information or advising whom we should contact to obtain this data.

A. F. Nierzwicki
Boeing Airplane Co.

—Mr. Nierzwicki has been advised to get in touch with the Welding Dept. of the U. S. N. Experimental Station, Annapolis, Md.

* * *

Requests 1937 article

Dear Sir:

In the July, 1937, issue of WELDING ENGINEER, there appeared an article by the writer entitled "Assembling steel plate work for welding." In retrospect, I believe this story is just as true and important today as it was then.

Could you send me a copy of this issue? It would be greatly appreciated.

Forest S. Major
Burnham Corp.

—Issue unavailable; photostat of article sent.

* * *

Filler metals

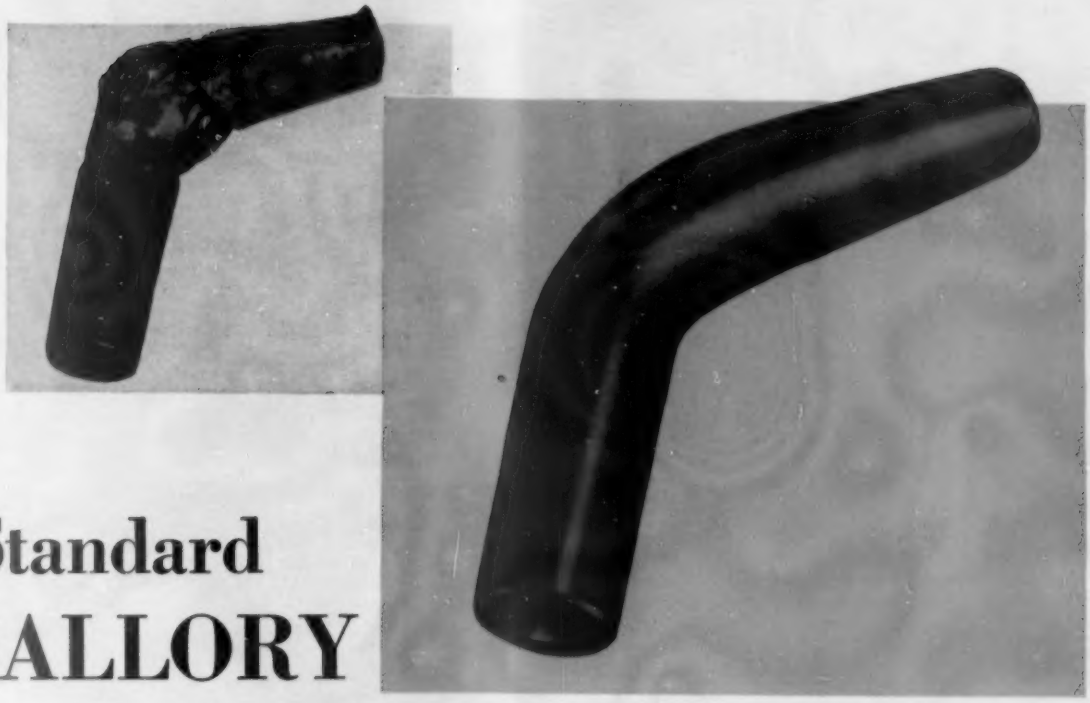
Dear Sir:

Congratulations on Mr. O. T. Barnett's fine series entitled, "Filler metals for joining", currently appearing in WELDING ENGINEER.

If not inconvenient, I would very

(Continued on page 79)

Why "Do It Yourself"?



Standard MALLORY Electrodes *Cost Less, Weld Better*

Makeshift, "home made" welding electrodes can cost more than you realize. Not only do they take a lot of time to contrive, but they seldom have the strength, conductivity and cooling facilities to give good welds and satisfactory life.

Before you "do it yourself," take a look at what Mallory has to offer, in the way of unusual electrode shapes. Literally hundreds of single and double bend electrodes that you may consider special are standard Mallory designs . . . which we can make promptly and economically using existing tool facilities.

Exclusive Mallory cold-forming techniques shape these bent electrodes from full hard rod stock, and develop high hardness and strength far beyond what can be obtained by conventional hot forging methods. Cooling tubes may be bent in place* by a special process, to provide water flow as near to the welding face as in the case of straight electrodes. These extra values designed into Mallory electrodes assure you of long life, long runs between dressings . . . more welds per dollar.

For information on available designs, ask your local Mallory Welding Distributor for a copy of the latest Mallory Welding Catalog, or write directly to us.

*Patent Number 2489993

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario.

Expect more . . . Get more from

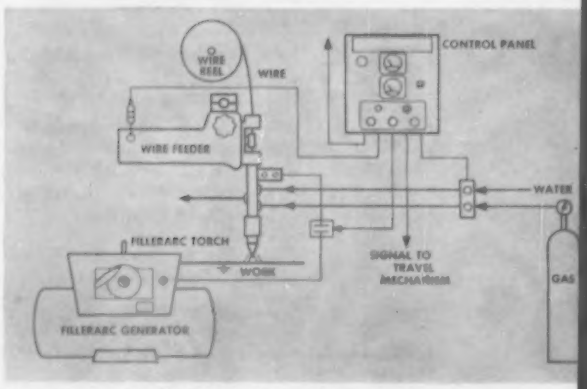
Serving Industry with These Products:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

WELDING ARCS NEWS



G-E FILLERARC EQUIPMENT is the only complete equipment especially designed for consumable-electrode gas-shielded welding. Simplicity of the system makes possible use of less expensive fixtures and greater over-all efficiency.

NEW G-E Automatic Welding System Uses CO_2 to Slash Gas Costs 95%

FILLERARC . . . first *complete* equipment designed especially for automatic gas-shielded welding; combines unique generator with low-cost carbon dioxide—for sound welds on mild steel.

General Electric's new Fillerarc Automatic Welding Equipment brings you—not only 95% savings in shielding-gas costs—but *sound welds on mild steel.* The great savings possible through use of CO_2 as a shielding agent have long been recognized—but good mild steel weld quality has never been obtained. Now, after two years of successful application of Fillerarc equipment on non-ferrous metals (using inert gas), G-E engineers bring you the total solution for mild steel welding—*savings plus high quality.*

95% SAVINGS ARE POSSIBLE because CO_2 costs only *1/20th* as much as inert gas. For the average job, Argon would cost $5.00 per hour, CO_2 only twenty-five cents. This means yearly savings per equipment may be as high as $20,000 on a 3-shift, 60% duty cycle basis. This new G-E system can now replace the submerged arc method on many jobs and eliminate many of the problems associated with granular flux.

EXCLUSIVE G-E GENERATOR practically eliminates the erratic weld quality formerly obtained with CO_2. Here's why: Only the G-E Fillerarc generator—with its exclusive *rising* volt-ampere characteristic— supplies an arc length which always remains constant, even with adjustments in wire speeds. This means minimum weld porosity and spatter—and deep penetration for extra-strong welds.

COMPARED TO OTHER INERT-GAS SYSTEMS, G-E Fillerarc equipment . . .

- Reduces gas costs 95%, for yearly savings up to $20,000 per equipment;
- Delivers consistent weld quality because of the unique G-E Fillerarc generator;
- Assures constant speed; system is insensitive to normal line-voltage changes;
- Provides wire-feed speeds as high as 1000 I.P.M.

COMPARED TO FLUX-SHIELDED METHODS, G-E automatic Fillerarc equipment . . .

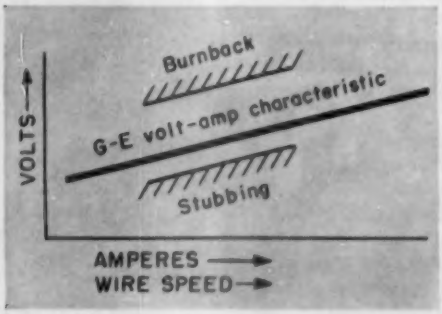
- Deepens penetration with low-cost CO_2;
- Provides a visible arc for full control of weld quality, permits less expensive fixtures;
- Does not use abrasive flux—especially important in welding compressor housings and similar jobs;
- Eliminates stubborn flux slag; cleaning costs are greatly reduced;
- Eliminates expensive flux recovery systems.

FOR MORE DATA contact your G-E welding sales engineer—and write for bulletin GEC-1334 to Section 713-1, General Electric Co., Schenectady, N. Y.

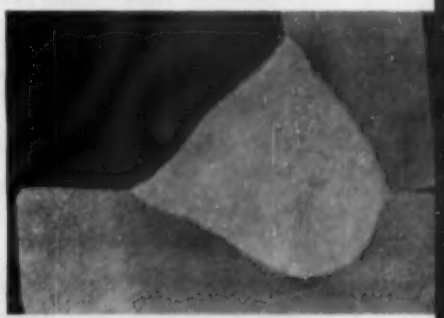
SEE G-E automatic Fillerarc equipment demonstrated at the National Metal Exposition, Philadelphia, October 17–21.

Why the complete G-E system makes possible quality mild-steel welds with CO_2

G-E SELF-REGULATING GENERATOR is the heart of the Fillerarc Automatic Welding system. Unique rising volt-amp curve maintains constant arc length.



RISING VOLT-AMP CURVE of the exclusive G-E Fillerarc generator matches rising arc curves . . . does not get into area of burnback and stubbing. Resulting high weld quality is uniform.



DEEP PENETRATION is produced by short arcs and faster wire speeds tpyical with Fillerarc equipment. Above: weld on semi-killed steel.

Progress Is Our Most Important Product

GENERAL ELECTRIC

ACCO products

3 Big Reasons for Buying PAGE Automatic Welding Wire

1. PACKAGED TO FIT YOUR PARTICULAR REQUIREMENTS
2. A WIDE RANGE OF ANALYSES TO FIT A PARTICULAR JOB
3. GREATEST CONVENIENCE—YOU CAN BUY FROM LOCAL STOCKS

PAGE packages its great line of welding wires in a variety of ways for utmost protection and convenience in handling, stocking and using.

Some of these packaging methods are shown at the left...There are lightweight, durable Leverpaks which give protection against coil distortion or wire corrosion. Easily opened and resealed, they roll easily and stack perfectly. They take a minimum of floor space.

There are single and pallet-mounted (1,000 lb., 2,000 lb., 3,000 lb.) coils, each wrapped in waterproofed paper and held secure by steel strapping; thread-wound, 25-pound reels to fit popular machines; also, coils in individual cardboard cartons, available singly or palletized for handling by fork-lift truck.

PAGE offers exactly the Right Analysis —26 in all—for every Welding Job...

No matter how "special" or "different" your welding-wire requirements may be, they can be met by one of the *26 different analyses* in the PAGE line.

These "cover the waterfront" of applications: heavy automatic submerged arc...light manual submerged arc...inert gas manual and automatic, tungsten or metal arc.

Carbon Steel • Any carbon from Armco (.025 max.) to high carbon (.90—1.10)

Low Alloys • All the most popular welding grades

Stainless • All standard AISI grades. Other types on request

The Right Electrodes, Rods, Spray Wire

Your welding job deserves the *right* electrodes and the *right* rods—and you can get them from the wide range offered by PAGE!

Gas Welding Rods • Armco, mild steel, low alloy, 3½% nickel, carbon or stainless steel, manganese or naval bronze

Bare Electrodes • Any carbon from Armco to high (.90—1.10) carbon

Metal Spray Wire • Any carbon from Armco to 1.00 carbon; also 3½% nickel, manganese or naval bronze, and stainless steel

Convenient Service from Local Stocks

Wherever you live, your nearby PAGE Distributor can fill your needs quickly and easily. This handy service saves time for you, and lets you keep your inventory investment at a minimum. Your PAGE Distributor thus makes double savings for you—a saving in time and a saving in dollars.

ACCO

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

Better Value

FULL-TIME, AUTOMATIC ARC CONTROL

with the NEW VICKERS® Controlarc®

MAGNETIC AMPLIFIER-RECTIFIER

DC Welder

- Easy, clean arc strikes
- Hot starts, immediate penetration
- No arc "pop outs"
- No current drop-off during pass
- Uniform fusion, steady rate of metal deposit

200 / 300 / 400 ampere models

Patented Vickers Magnetic Amplifier...

CONTROLARC automatic control is made possible by the patented Vickers Self-Saturating Magnetic Amplifier with exclusive voltage-sensing, feed-back control circuits. Constantly analyzing welding voltage and automatically adjusting welding current to arc changes. Vickers Magnetic Amplifier maintains ideal arc characteristics, through the entire welding range, under all welding conditions.

Voltage and Current Individually Controlled...

Separate, complete control of both voltage and current makes it possible to set up any volt-ampere combination within the output range of the particular Controlarc model being used . . . from minimum voltage at minimum current to maximum voltage at maximum current. Only Vickers Controlarc offers complete remote control of voltage and current through the entire welding range.

Full Range Voltage Control...

. . . separate from current control, permits choosing the exact arc characteristic for every job and welding condition. Voltage control is full range and stepless, with no limited "average" settings or blind spots. The weldor can select the arc characteristic for a basic welding position and pinpoint the setting for particular conditions.

Downdraft Cooling
No "vacuum cleaner" floor dust pickup.

Rectifiers
Conservatively rated for long life. Special finish protects from corrosive atmospheres.

Rust Protected
Interior surfaces zinc chromated.

Sealed-in Lubrication of Fan Motor Bearings

Duct-Cooled Transformer
Air ducts in windings for high-efficiency cooling.

Concentrated Weight
Low center of gravity.

Skid Mounted
Portable mounting available.

WRITE TODAY FOR NEW BULLETIN

VICKERS ELECTRIC DIVISION

TERRITORIES OPEN FOR QUALIFIED DEALERS. WRITE FOR DETAILS.

VICKERS ELECTRIC DIVISION

VICKERS Inc A unit of Sperry Rand Corporation

1851 LOCUST ST., ST. LOUIS 3, MO.

Welding industry's
greatest
cost-cutting twins . . .

IDEALARC and JETWELD

Never before has any combination of welder and electrode offered such a cost-saving potential in faster, easier welding. Here's why:

Idealarc for easy, efficient operation . . . first welder to give you *both*
AC AND DC WELDING CURRENT
with Dual Arc Control where you select "soft arc" or "forceful arc" on AC as well as DC
and in addition . . . hot starting on DC as well as AC

Jetweld for high-speed operation . . . first universally adopted iron-powder electrode for
extra-fast welding
high deposition
drag operation

LET LINCOLN DEMONSTRATE HOW YOU CAN PROFIT . . . NOW.
Send for Bulletin 1343. Write . . .

THE LINCOLN ELECTRIC COMPANY
Dept. 1704 • Cleveland 17, Ohio
The World's Largest Manufacturer of Arc Welding Equipment

ESTABLISHED 1916 **Welding Engineer** SEPTEMBER, 1955

Doing anything—good?

THERE is a story about a fellow who got his brother-in-law out of jail, gave him a job, let him live in his home, play golf at his club and even use his car. But when the brother-in-law was reminded of this, he came back with, "Yeah, that was last year. What have you done for me lately?"

What have you done for welding lately? You may be working at welding, but are you working for Welding? Sure, if you are a welding distributor you may have sold some welding machines, but—did the customer want them, and did you really stress his need for welding equipment and how welding could advantageously be used? By the same token, an engineer may have designed a welded structure, but—did he create the desire in someone that caused the structure to be built?

There is a tremendous selling, as well as educational job to be done. Anyone with an interest in welding should be trying to sell and educate those who join materials on the importance of welding.

ONE of the spots where we must continue to do an educational job is in the engineering and design phases of welding. Too many plants leave design problems up to the shop weldor. *The weldor's job is to join two pieces of metal.*

Even if he were also a design genius, he would be unable to do the job unless he knew the service to which the weldment would be subjected. He must know the strength that is required and all the other vital information that is *almost never* supplied to him.

A design involves a great deal more than correct calculation of stresses, the selection of the right materials and the best means of fabrication. To get best results from any design it is necessary, first, to understand clearly the function the product is to perform and then approach the problem with a flexible, open mind. Unfortunately, that is not always the easiest thing to do.

Tradition, precedent, or whatever you wish to call it, seems to play an important part in the lives of many designers who sometimes are called upon for a welding design. They generally do their best to make this design look like the object it replaces.

They don't know why they do this. Perhaps it's because they feel such an achievement is right and proper—and that's that. Such a designer usually is flattered when you tell him his welded product looks like a casting or forging after it has been sandblasted.

A TRUE welding designer would be insulted by such a statement. He would know that such a resemblance usually means he has failed to take full advantage of the engineering freedom made possible by welding.

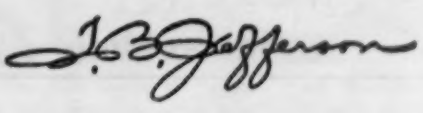
There are two important features evident wherever welding is used as a means of joining metals: *welding has proved reliable and economical.* In fact, some of the savings reported seem almost fantastic, yet welding has barely scratched the surface in some fields.

In two fields, welded steel structures such as buildings and bridges, and in the welding of machinery and machine parts, this is particularly true.

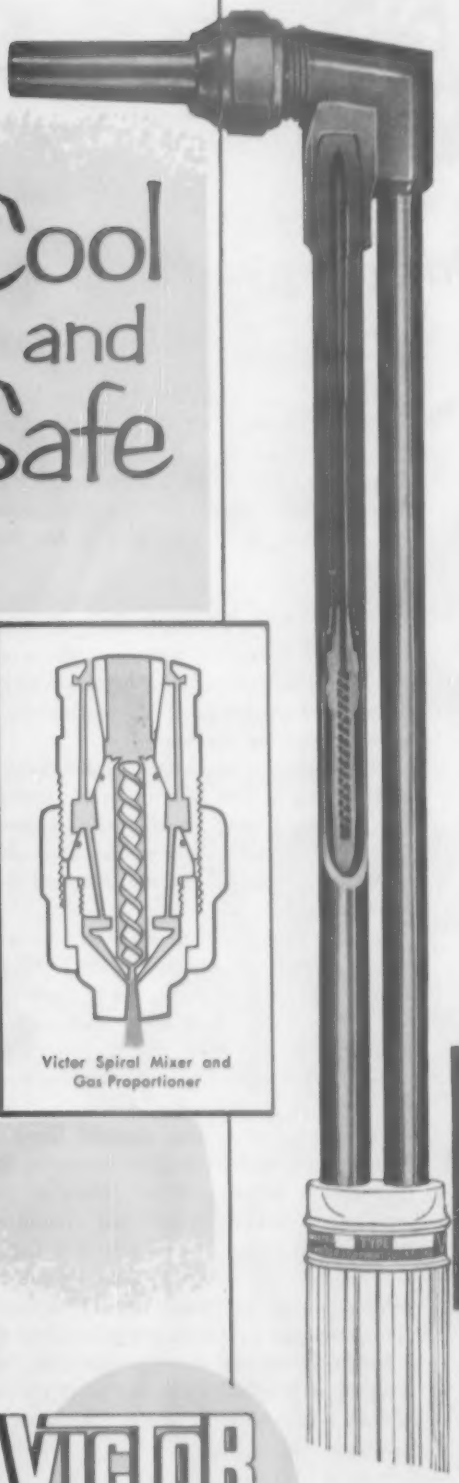
Welding has proved more economical in both fields, so the economy factor doesn't enter the picture. Likewise, safety consideration simply cannot stand as a reason for avoidance.

There just isn't a good answer! These same designers know that on high-temperature, high-pressure vessels, when no other means of joining is satisfactory, welding is accepted without question. It is difficult to understand why it is that, when a job becomes too tough to join by other means, welding is quite acceptable. Could it be that we have not sold enough people on this point about welding?

Maybe if we told more people that "when the job gets too tough to do in any other manner, weld it," we would have a lot more enthusiasm about welding.



Cool and Safe



on the HOTTEST, TOUGHEST Cutting jobs...

VICTOR

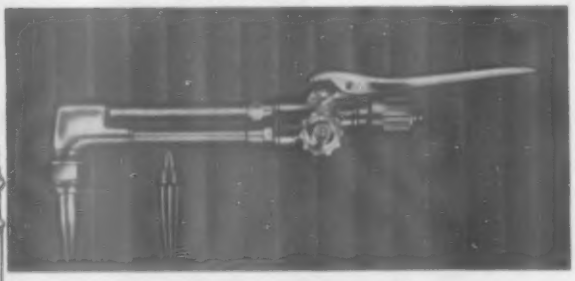
CUTTING TORCHES*

* With stainless steel head and tube assemblies.
* Time-tested spiral mixers

NOW all Victor torches and cutting attachments have rugged, stainless steel head and tube assemblies, plus time-tested spiral mixers to give you cool, safe cutting on your toughest, hottest cutting jobs. Stainless steel assembly absorbs heat slowly, withstands roughest use, is easier to maintain. Famous Victor spiral gas mixer prevents flashback and back fire, thoroughly mixes gases to make your gas dollars go further. Head and tube assembly is one unit, and can be replaced without buying a complete torch.

Test the Victor cutting torch on your most demanding, severest cutting job. See for yourself how cool it stays, how fast it cuts. Your Victor dealer will gladly demonstrate it. See him *today*.

Victor Spiral Mixer and Gas Proportioner



Cutting attachment, and cut-away of a typical Victor tip, showing carefully proportioned orifices. For best results, always use Victor tips with Victor torches.

VICTOR for welding

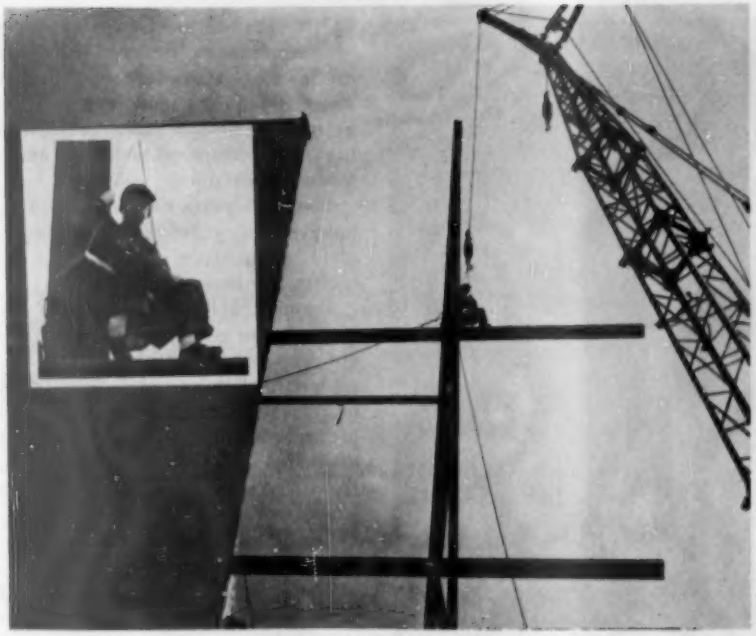
VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

844 Folsom St.
San Francisco 7

3821 Santa Fe Avenue
Los Angeles 58

25



INSPECTING steelwork her welding firm erected for a drive-in theatre, Mrs. Bernice McPherson (inset) looks cool and collected as she swings 48 ft above the ground in a bosun's chair

The lady is a weldor

As unique in her own way as a male librarian or secretary is Mrs. Bernice McPherson, founder, president and top hand of the B & M Welding and Iron Works of Gaithersburg, Md., and as able a weldor as ever struck an arc.

Mrs. McPherson is the only lady steelworker in her home county (Montgomery), and probably the only lady weldor-executive in the United States.

In her routine duties at the B & M office, Mrs. McPherson is almost as much at home as her husband. But the people who work there will tell you she'd much rather be out on the job.

Ordering steel, checking specifications and figuring tolerances, it seems, provide too little excitement for this agile lady.

Even for the greater Washington, D. C., area, where women are senators, officers and—until lately—cabinet members, Mrs. Mac does more than hold her own. In addition to her other accomplishments, she also serves as chairman of the American Welding Society's Washington section.

An Early Start

One of the smallest construction bosses to be found anywhere (103 lb, 4 ft 11 in.), Mrs. Mac first tried her hand at welding when she was 7 years old.

A blacksmith employed by her father used oxyacetylene gas, and since she was "the sort of child who couldn't keep her nose out of anything," Mrs. Mac succumbed to the call of the bright welding flame.

That big day, she admits, was "a while back", and the experience gained in the years between certainly gives Mrs. Mac the edge over any would-be feminine competitors.

The firm which she and her husband now operate was started by Mrs. McPherson as a one-woman outfit in 1944. Today, B & M has 16 employees, and engages in the welded construction of everything from schools and churches to drive-in theaters and office buildings.

Have Rod, Will Travel

A normal day for Mrs. Mac might begin around 6:30 a.m. with a rush call from a company sorely in need of an emergency welding job. This might be followed by a quick trip into the office to check the morning mail, then a visit to any or all of B & M's current projects.

After a hurried lunch, Mrs. Mac may be off to Chevy Chase or any one of the numerous surrounding communities to submit a bid on a proposed welding job. Following this, she may finish the day by driving to a job site and pitching in with a welding rod.

But it isn't only in the rough-and-ready world of production that Mrs. Mac shines. She's also adept at one of the pastimes more commonly acknowledged as femiine—i.e., cooking.

The kitchen range is an old friend to this lady weldor, who also is a mother of two nieces, aged 9 and 12.

ABOARD a truck-borne crane with one of her 16 employees, Mrs. Mac takes a brief pause in her busy daily schedule which usually includes every form of activity from office work to welding

GARBED in protective clothing and wearing masks, employees at the Hanford Atomic Operations plant remove a contaminated unit from service. Wrapped in a plastic vinylite sack for transportation, the unit eventually will be decontaminated or, if that is impossible, destroyed

Atoms in Industry:

Welding repairs in radioactive areas

BY E. B. LA VELLE and J. M. FOX, JR.*

A new environmental factor, radioactivity, has entered the industrial plant. In the last 10 years, a body of knowledge has been developed by working with this factor. Newcomers to this type of business will find standard operations, processes, costs and plant maintenance colored by the highly specialized requirements inherent in this field. Here's how one plant has handled maintenance operations successfully for over a decade under such conditions.

THE normal problems of plant maintenance are considerably complicated whenever that maintenance is required in an atomic energy facility. Also, relative cost is very high when compared to contact maintenance operations.

In the 11 years since Alamagordo, however, a growing technique in plant maintenance of radioactive facilities has been developed.

Permissible limits are known, work intervals are established and controls are imposed. Detailed preparations, protective clothing and devices, timed movements and rehearsed operations protect personnel and insure success of maintenance welding operation. However, some modification of existing welding equipment and techniques is indicated in order to overcome the problems encountered.

There is need for recognition of these problems by the welding equipment industry so that, as atomic energy develops into wide industrial use, equipment will be available to maintain it.

Nuclear Energy

Plutonium, the material produced at Hanford, is not easily manufactured. It is a new element created by nuclear fission. The process of its manufacture and the materials with which it is associated give off very large amounts of radiation.

We are concerned basically with high-energy radiation when working with atomic energy. High-energy radiation emerges from the nucleus of the atom. Hence, it is more properly termed nuclear, rather than atomic energy.

There are several different classes of radiation, but the effect of each is similar on living cells and tissues: the tissue is ionized by radiation. The type of injury is the same, but the degree of damage may be different.

Limits of exposure to radiation and standards of protection were developed from basic work that had been done with radium and X-rays. It was known from injuries that had been suffered by laboratory workers handling radium and exposing themselves to X-rays, that protective measures must be given adequate consideration.

Working in the laboratory, and

*Mr. LaVelle is in the Engineering Dept., and Mr. Fox in the Manufacturing Dept., of General Electric Co., Richland, Wash.

working on radioactive equipment that must be maintained in a plant, are quite different. To anticipate all conceivable conditions of radioactive equipment maintenance requires detailed and meticulous attention.

Standardization Trend

The design trend is toward greater standardization so that maintenance operations may benefit from the decreased need for items of spare equipment. Simplification in the use of welding tools, materials and protective clothing for certain specific jobs also simplify the maintenance operation.

It is necessary to provide process equipment with as long an anticipated service life as possible, and the time spent in design, though rather detailed by normal standards, seems to be justified if additional longevity and simplicity can be achieved.

Mechanical simplicity is the requirement sought. This not only presupposes less operational difficulties, but offers greater possibility of maintenance in case of failure.

The contamination of process equipment ordinarily results from deposit or attachment of finely-divided radioactive substances on the surface of metallic material. The degree of radiation emitted by these particles may range from the insignificant to that which prevents handling except by remote methods where the operator is shielded from the operation by lead, concrete, water or comparatively great distances.

Radiation Survey

No maintenance operation is considered without an adequate survey for radiation in the work area. The location and intensity of radiation is made a matter of record. This permits maintenance personnel to determine whether it is practical to attempt decontamination of the job area and repair the specific item, or whether replacement is indicated.

A radiation survey made also indicate that certain equipment is abnormally subject to contamination and that future design changes are indicated for similar equipment.

The 1954 revisions to the Atomic Energy Act anticipate greater private and industrial participation in the use of nuclear facilities. As this trend develops, a description of the effect of radioactivity on standard industrial operations is timely.

It will be necessary for industrial concerns moving into the radiological field to familiarize themselves with the mechanics of dealing with problems contingent upon such operations. A new work philosophy is involved.

Up to the present, prime consideration has been given to expeditious and effective accomplishment of work under standard personnel safeguards. The overriding concern in atomic installations is adequate protection of personnel.

Safety Record

There is no wish to dodge this responsibility, as is evident in the safety record established at Hanford during 11 years of operation. This record is based on the standard methof of accident tabulation used throughout industry.

The Hanford Atomic Products Operation has won the sixth consecutive Award of Honor offered by the National Safety Council for outstanding safety performance. During the period from February through September, 1954, we worked over 9,400,000 manhours without a disabling injury.

During 1954, our major injury frequency rate was 0.31, while that for all industry during 1953 averaged 7.44. Our major injury severity rate during 1954 was 19.0, while that for all industry during 1953 averaged 8.30.

Actual practice exposes the worker to less than the radiation level established to control exposure of personnel. There is no case of serious overexposure of a worker at Hanford in the history of the plant.

All facets of normal industrial procedures are affected by radioactivity, but none, perhaps, as greatly as maintenance practices, which are always a subject of much concern and study.

Cutting and Welding

Within the maintenance framework, cutting and welding are essential tools and, even in atomic installations, have not changed as much as we would wish in the essentials of equipment or operation. The way in which they are used and the conditions under which they are used single out cutting and welding for attention.

The factor of radioactive contami-

MOCK assemblies give weldors an excellent opportunity for practice needed to complete an often difficult job in a very short time

MONITOR inspects weldor after completion of repair job on radioactive material. Unusual conditions of radiation are reported and future procedures are developed which will guard against personnel contamination

nation or the presence of radiation creates a difference. It is the reason why, for example, a weldor who has laid down a weld bead needing only one inch more metal for completion may be relieved at that precise point. Or why a ten-minute cutting job may involve a meteorological report, an hour's setting-up time, a portable exhaust fan, a hood and a filter.

Under normal conditions of plant maintenance in industries other than those concerned with radioactive materials, maintenance procedures have become fairly standardized through continued, repetitious work. However, with the necessity for maintenance work on radioactive process equipment, a new and important factor has to be introduced into cost calculations.

The weldor no longer approaches the work area at random or at his will. All operations, even the simplest, must be completely organized. Nothing can be left to chance or dependence upon the trade knowledge of the individual weldor. Complete control of every phase of the maintenance operation must be maintained. And not the least of these is the radiation survey that precedes, continues during, and completes each job.

Necessity for Precision

Standard welding and cutting procedures can be used when working under radiation controls. The only difference is that local conditions may make extensions necessary on cutting torches, electrode holders or inert-arc torches. Also, greater attention must be given to absolute precision of technique and procedure.

The schedule may not tolerate a failure to make a satisfactory weld.

Our maintenance weldors continually are making suggestions to improve our approach to these situations. There is no fear of radiation among the people who have worked with it, and our weldors accept the adverse conditions under which these operations must be performed.

Most operations are performed on stainless steel, so it is customary to use cutting electrodes, flux-injection or iron-powder cutting for such work. It is not necessary to use exhaust units when the inert-arc process is being used, but in certain locations the other welding processes require a disposable filter which collects all fumes.

Welding clothing is not too comfortable at best, and it is now necessary to add, in addition, other equipment and clothing in order to safeguard the weldor from contamination. It is believed that improvements could be made in this direction.

All-Purpose Clothing

The weldor should be as comfortable as possible in order to make him effective at his assigned task. Equipment manufacturers might possibly develop clothing which would better serve the triple purpose of protecting the wearer against thermal radiation, hot metal from the welding operation, and radiation from the equipment on which the work is being done.

At present, the weldor must wear normal protective clothing used by all persons in a contaminated area and, in addition, leather gloves, jackets and coveralls if he is using a welding or cutting process that expels molten metal from the weld area.

The type of mask worn is governed by the kind of particulate matter and not by the level of radiation. Assault masks, Chemox, and fresh-air masks are worn, the choice depending upon the work to be done. Fresh-air masks may be serviced from cylinders, or by a fresh-air line from outside.

Welding equipment should be developed which is pointed toward this specific type of maintenance welding operation. Welding hoods which could be removed without interfering with the breathing equipment would be helpful.

There appears to be little question that, as welding technology increases, methods of welding and cutting by remote control will be developed. There is great need at the present time for such devices, but none have been developed that are usable outside the laboratory.

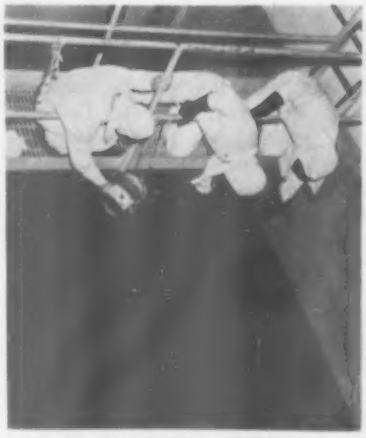
A correlation of experience as the atomic industry develops is needed so that all can benefit from data that has been accumulated since maintenance of atomic facilities became a necessity.

A great deal has been said about the danger of working with radioactive materials. Yet, with proper consideration for the hazards involved, and with competent training, supervision and planning, any situation encountered in such work can successfully be met.

A big and important challenge to industry is offered by this situation.

STAINLESS steel pipe joint is welded in radiation zone. Well-trained weldor appears at ease and confident after training on mock set-up

OXYGEN breathing apparatus is displayed by a Hanford weldor. Limitation which an encumbrance of this type places on a weldor's mobility is obvious



UNDERWATER cutting job is performed by two workmen while a third surveys the area for radiation. Water provides excellent protection

WELDING ENGINEER isn't taking anyone's side in the question about to confront the welding industry—which is better, aluminum or copper welding cable? Our primary interest since 1916 has been in promoting welding. When such specific questions arise, this publication tries to present both sides. Therefore, WELDING ENGINEER invites some responsible member of the welding industry from the other side of the fence to submit his views.—The Editors

"WITH the coming of lighterweight cable, the weldor's burden will be diminished because of the greater flexibility and mobility which help to reduce fatigue"

Aluminum vs. copper cable

The case for aluminum . . . . . By RAY L. TOWNSEND, *Tweco Products Co.*

WELDING cable made from aluminum is not really new. Aluminum wire and cables have been made for many years, and aluminum *welding* cable has been used in Germany for several years.

In Germany's case, necessity was the mother of invention. During the last war, sufficient copper was not available, so the Germans turned to material to which they had access. But while they provided themselves with a usable product, their aluminum cable left much to be desired.

Now, Tweco Products Co., Wichita, Kan., has introduced to the American market an aluminum welding cable known as "Tweco-Lite."

Lightweight welding cable has been a goal for many years. Perhaps the weldor himself has thought about and envisoned this more than anybody else. In his effort to make his task easier, he has provided himself with lighter whip cables attached to the end of the main lead cable.

The man behind the mask is a true artisan and, in order to do a full day's work, he needed the portability of a lighter cable to permit him to properly perform the welding operation.

The use of smaller and lighter 10 to 15-ft copper whip cable has been a means to an end. Small whip cables are the cause of "dammed up" current requiring higher machine settings to deliver a proper volume and pressure of current (amperage and voltage) at the electrode holder. This has caused machines, cables, and holders to run hot—to say nothing of the weldor's gripping hand.

Reduces Fatigue

With the coming of lighter weight cable, the weldor's burden will be diminished because of greater flexibility (portability) and reduced fatigue. Full-sized welding cables from the welding machine to the electrode holder permit a free flow of the machine's output right to the electrode. The weight of the rubber-covered aluminum conductor is less than half that of the same size of copper cable.

Where the full-sized aluminum conductor is used as a whip cable for convenience's sake, the weight will ordinarily be no more (and often less) than the weight of the small, undersized copper whip cable commonly used.

Where aluminum cable of one size larger than copper is used, the weight will be about one-half that of the copper cable. The feeling of lightness, plus the flexibility, provides a sensation to the operator that should be conducive to more and better production.

Up to now, in this country, copper welding cable has been the accepted standard because of its high conductivity and ease of manufacture through high speed drawing of copper wire to a size 34 B & S gage wire which provides required flexibility for field usage.

While efficient as a conductor when properly connected, this type has

often drawn the complaint of heavy weight. This has been especially true when larger sizes are used on higher amperage work and outdoor construction, as well as on jobs requiring long runs of cable.

Copper, until this time, has had no competitor for welding-cable application.

Cuts Weight Factor

With the coming of aluminum welding cable, the weight factor is cut to less than half that of copper. There are some distinct advantages and few disadvantages to using aluminum for a welding cable.

The few disadvantages can easily be coped with when the nature of working with a metal different than copper is understood. Any disadvantage is outweighed by the advantage of the weight factor and by the economies of cost.

In using aluminum cable, it should be remembered that the conductivity factor is only 61% of its copper counterpart (all cable connection being equally sound). While conductivity, size for size, is in favor of copper, aluminum by weight will carry 201% the current of copper.

Copper is approximately three times denser than aluminum, thus weighing about three times as much as identically-sized aluminum counterparts.

Apparently, continuous dead-load knowledge of conductivity has been applied by electrical engineers to the two metals. This tended to eliminate aluminum as a metal for welding cable. These engineers felt a necessity for increaed size of aluminum to meet the highly variable, but predominantly low, duty cycle of the average welding cable circuit.

Heat Dissipation

The one factor overlooked is the inherent quality of aluminum to dissipate heat much faster than copper. Size for size, it will dispel its heat almost twice as fast. The three-times heavier copper, while more conductive, tends to hold on to its built-up heat.

This heat in a welding cable dissipates through the length of the conductor which, in turn, transmits it to the rubber jacket for final dissipation.

Aluminum's capacity for losing heat works hand in hand with the manual-arc welding process—normally one of low-duty cycle in the average shop. A 30% to 50% duty cycle (arc time) is most common. Shops using manual-arc welding seldom exceed 75% duty cycle.

The duty cycle for welding machines is rated at the percentage of arc time during any ten-minute period of total elapsed time. Therefore, the "off-duty cycle" permits fast-cooling aluminum to take better advantage of the process.

This cooling of aluminum is not unlike the cooling effect water gives small copper cables that carry high amperages in Mig (metal inert-gas) and Tig (tungsten inert-gas) welding.

In selecting the size of aluminum cable, consideration should be given to duty cycle and the length of run required from the machine. If the duty cycle is low (30% to 40%) and the distance short, it will ordinarily be found that aluminum cable of the same size as copper can be used.

When to Increase Size

If the duty cycle is medium to high, it is a good rule of thumb to increase by one size or number the AWG (American Wire Gage) rating over that of copper normally used. This is especially true on long runs of cable where the welding operation is some distance from the machine.

One other factor should be recognized: the aluminum conductor of the new cable, having one-third the density of similar copper cable, is necessarily of a more fragile nature than the No. 34 copper wires. Size No. 30, the smallest aluminum that can be economically drawn for this purpose, is used.

To get the desired properties of strength, flexibility and resistance to breakage from continuous bending that in most respects makes it equal to copper cable, the aluminum wire is semi-annealed, whereas most copper cables are of dead soft temper.

The aluminum conductor is pure electrolytic material, providing the greatest conductivity.

The Cable Jacket

Two grades of jacketing are provided. Where long life under the most rugged conditions is desired, an N-60 grade Neoprene jacket is available. A lower-quality jacket of synthetic rubber is used on the other grade of cable.

A factor in favor of an aluminum conductor covered with a rubber compound: the usual curing compounds containing sulphur will attack copper conductors, yet have no effect on aluminum.

Copper cables are attacked by the sulphur, causing deterioration through oxidation. When the cover is stripped back on a new copper cable, the outer strands will often be oxidized.

Old copper cables are full of oxide dust which can be shaken out of the conductor when a break is repaired. Some copper-cable manufacturers use an aluminum foil separator between the rubber cover and the copper core to lessen sulphur attack. While aluminum takes on a surface oxidation, it ceases to corrode, and the strands remain bright.

Connections

Proper cleaning of the aluminum conductor when making either a soldered or mechanical joint assures a good connection.

Good, high-pressure mechanical joints are recommended as a means of joining aluminum to aluminum or aluminum to copper, whether it be cable lugs, cable connectors, termi-

Comparative Weights and Wire Count

AWG CABLE SIZE	WEIGHT PER 1,000 FT ALUMINUM (lb)	WEIGHT PER 1,000 FT COPPER (lb)	WIRE COUNT ALUMINUM	WIRE COUNT COPPER
4	99 lb	222 lb	420	1029
2	137 lb	319 lb	665	1666
1	173 lb	385 lb	836	2058
1/0	211 lb	466 lb	1064	2646
2/0	253 lb	570 lb	1330	3234
3/0	282 lb	706 lb	1680	4067
4/0	341 lb	910 lb	2107	5096

nals, electrode holders or ground clamps. Short of extrusion, the higher the pressure obtained in the joint, the better conductor it will make, especially between dissimilar metals such as aluminum and copper or brass.

Reference here is to clamp connections, screw connections, or impacted connections, Screw-type connections that burnish their way into the conductor strands, removing any surface oxidation that may be present, are excellent. Low pressure or loose connections can be expected to give equal heat and trouble with either aluminum or copper cables.

Low-pressure, small "Allen" screw-clamp-type connections should be watched closely for heating and should be retightened when found loose. Contact area of the connection is important, but pressure at contact point is much more important if the connection is to run cool.

Extreme care should be taken when stripping the rubber insulation from the connection ends. "Circle-ringing" or otherwise cutting the strands should be avoided.

When making a mechanical cable connection, it is good practice to use a fine emery or wire brush on the bared cable end to remove any surface oxidation that may be present. After cleaning, zinc chromate paste, petroleum jelly or a light machine oil should be applied to the surface of the bared strands before tightening the connection.

Lubricants Help

This coating excludes air from the cleaned surface, preventing the formation of a new layer of oxide. The lubricant does not hurt conductivity but aids screw-type connections. Surplus sealants should be removed to prevent any deterioration of the rubber covering.

The connecting or joining of aluminum cables and working tools is easily accomplished. There are several good solders on the market that will permit the joining of aluminum cables to copper lugs or terminals. The application is no different from that of sofe-soldering copper cable, other than materials used.

For those desiring to use aluminum cable on more or less continuous-duty automatic welding, it is recommended that cable two sizes larger than copper be used. Or smaller cables should be doubled up to permit proper amperage flow without excessive heating.

Comparative Amperage Capacity

AWG Cable Size	Amperage Capacity Copper (100%)	Amperage Capacity Aluminum (61%) 100%		Nominal Variable Amperage Capacity Based on Intermittent Duty Cycle Usage 80%	60%	50%	40%
4	100	60	60	85	100	110	120
2	200	120	120	140	200	220	240
1	250	160	160	190	250	275	300
1/0	300	200	200	240	300	330	360
2/0	375	250	250	300	375	410	450
3/0	450	300	300	360	450	490	540
4/0	550	375	375	450	550	600	650

Cable tests are normally based on a starting ambient (room temperature) of 104 F to 140 F top testing range. The higher the temperature at which cables are operated, the better the insulating jackets need to be. Oftentimes, sun temperature on building and tank tops is much higher than the normal 140 F top operating range for test purposes.

Western desert and certain industrial conditions impose intense heats that will make any conductor run hot. Whether it be aluminum or copper, whether it be the Arctic or the desert, improper connections or sizes will cause welding cables to run hot.

Wide Use of Aluminum

Field experience is proving aluminum conductors suitable for many applications once thought possible only with copper. Major welding machine manufacturers now use aluminum windings in their equipment.

The world's largest transformer, installed just outside Chicago in 1952, has aluminum windings; the ctiy of Paris is wired largely with aluminum wire; steel-cored aluminum strands carry much of the high voltage current from power generating plants in this country; aluminum bus-bar of slightly larger dimensions with proper surfacing is fast replacing copper on much heavy electrical equipment; many power companies are using aluminum service drops to their industrial and household users.

The bugaboo of galvanic corrosion in some applications has proven unfounded. Short of immersion in salt water, little fear need be felt. Under such conditions, copper has its problems, too, the action being only a little more intense with aluminum.

Aluminum welding cable will be used on the oil drilling barges off New Orleans just as it will be used along the fresh water shores of the Great Lakes. Connection problems around salt water will be more severe and require closer maintenance where galvanic conditions prevail.

Advantages of Aluminum

Sufficient conductivity with the high heat-dissipating qualities of aluminum makes it an ideal conductor for welding cable duty. Lightness and cost of the metal in comparison to copper definitely point the way for its expanded use.

It is reasonable to expect that, as aluminum cable for welding is accepted, the technology of its manufacture, together with volume production, will increase, permitting the product to be even more competitive with copper than it is today.

In the event of a more severe copper shortage, aluminum's comparative abundance would provide a better source of material.

Simply, and aside from economic considerations, aluminum welding cable is efficient, light, and a big help in easing man's labor.

Next Month

The American Welding Society will hold its national Fall Technical Meeting in Philadelphia on October 17-21. Don't miss the informative article on this meeting appearing next month in . . .

Welding Engineer

TRIBUNE weldor uses an electric arc process to repair press angle bar. Bar turns or redirects paper on presses

MODIFICATIONS in presses play an important role in *Tribune* weldor's work schedule. Steel frame for compensating roller was fabricated by welding and mounted on top of press

NEW all-welded design for printing plate carriers called "skids" won weldor Montgomery $100 contest award. Welded model is cheaper, shows no signs of wear after rough usage

STORAGE racks for rubber press rollers were formerly bolted. Now welded, they hold one-third more rollers

BY JACK FAIRLIE

A newspaper needs

THE press rooms of the *Chicago Tribune* are vast caverns which house the physical components of one of the largest and most efficient publishing plants in the United States. Keeping these presses rolling is a 24-hour-a-day job demanding the combined talents of a large press crew and 40 maintenance machinists.

Among the latter are three full-time weldors, one of whom, John A. Montgomery, describes his welding work as "principally one of quick service.

"When a breakdown occurs, time spent on repairs has to be measured in minutes—perhaps hours. Repair work that takes days is simply out of the question when you're trying to service almost a million customers each day." Montgomery said.

Ample evidence of the amount and quality of repairs and additions accomplished by *Tribune* weldors can be seen throughout the press rooms.

Here, a large steel frame designed to hold a compensating roller has been fabricated by welding and placed at the top of a press, 40 ft from the floor. There, cracked under the weight of tons of equipment passing over it, a cast-iron floor-plate impregnated with silica carbide grains has been neatly welded.

A drive unit for the color "deck" of a large press shows a conglomeration of scars.

"That happened three years ago, during a night run of one of our earlier editions," said Montgomery. "A printing plate shook loose on a cylinder. Fastened down, it had 3/1,000 of an inch clearance. Hanging even ¼ in. out of place at that speed—well, the shock was great enough to tear the cast iron drive unit housing like paper."

Assuming the drive unit and its ½-in.-thick cast-iron oil pan cover to be a complete loss, the *Tribune* immediately ordered replacement parts. But the press was an old model and the manufacturer notified the paper that three months were needed

welding "in a hurry"

This is the first in a series of articles on maintenance welding operations in service industries which WELDING ENGINEER will present over a period of several months. We hope you will enjoy these presentations of the "vital statistics" involved in welding applications that normally receive little attention.

to make patterns for new parts.

Three months—like ninety-nine years—is a mighty long time where a metropolitan daily is concerned, and so the welding crew was put to work.

Beveling a vee on the broken cast iron parts with a hand grinder, and using coated nickel electrodes, the men worked for 26 straight hours to put the press back in operation.

Excessive Heat Avoided

No preheating was done, and excessive heat during the operation was carefully avoided. Intermittent skip-welding and peening helped to eliminate distortion and reduce stresses, while at the same time allowing the work to cool.

The outside casting was brazed, and for the past three years, the press has seen continuous operation with no further breakdowns and no abnormal oil loss.

The work to be welded was taken off the press in this instance. Exceptions to this established rule are few. The fire hazards in a press room—with its quantities of paper, and flammable inks, oil and grease—are very great and present at all times.

A rare exception to the work removal rule occurred when the press fittings and ¾-in. bolts that held a carbon steel "bearer" on a plate cylinder broke. After considering the problem, the superintendent of machinists, A. Schultz, decided that welding the 16-in. diameter bearer ring to the cylinder would prevent a similar accident in the future.

Mild Preheating

The bearer and cylinder were preheated to a temperature (350F) within safety limits. Using a type 310 stainless steel electrode, a fillet weld was made, the weldors working on alternate sides of the shaft to prevent misalignment during cooling.

The cylinder was removed from the press a year later, and the weld was found to be still in good shape.

Parts to be welded, flame-straightened or flame-cut usually are removed to the newspaper's well-equipped welding shop, adjacent to the main press room.

There, weldors can make use of a Tig (Tungsten inert-gas) welding unit, an a-c transformer and a d-c generator; two oxyacetylene torches; an automatic flame-cutter, and a grit-blasting machine for use in cleaning parts to be brazed.

One of the most common jobs performed by Tribune weldors is the building-up of shafts holding rubber rollers which see constant press use. The number of rollers serviced—and their weight — prompted Montgomery to build a special turning jig which mounts the rollers at a proper height for welding.

Full of ideas for welded improvements in the printing plant, Montgomery recently won a $100 award in a competition sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland.

Montgomery's paper described how $13 could be saved on each "skid" used to carry printing plates to and from the presses by fabricating these skids with the arc-welding process. Skids which he has made have shown no signs of wear, even though they are subjected to constant rough usage.

Further improvements fabricated by Montgomery were welded steel press ladders, which replaced the more dangerous "monkey-poles", and movable stairs on which pressmen stand to mount printing plates on the press cylinders (these stairs, which formerly blocked aisles between press units, can now be easily raised and stowed against the sides of the presses.)

Increased Capacity

Welded steel racks for rubber press rollers enabled pressmen to store one-third more rollers in the same amount of space than could be stored in bolted racks.

No estimate of the amount of weld metal used annually in its maintenance work has been made by the *Tribune*. However, records indicate that the most popular electrodes are the low-hydrogen coated types E6015 and E6016. For mild steel uses, the E6010 is the choice of *Tribune* weldors.

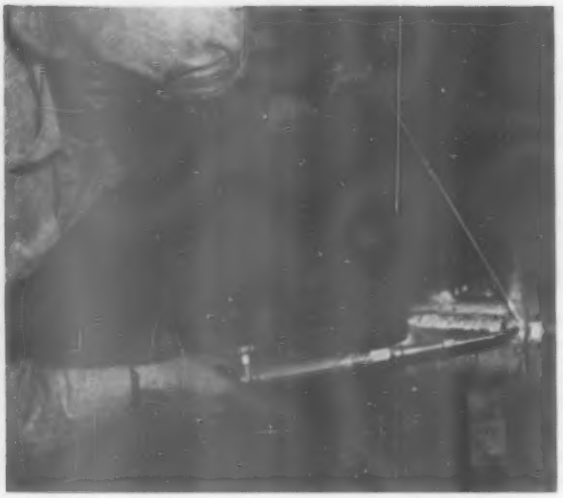
Not all of weldor Montgomery's time is spent in making welds. Flame-straightening shafts and beams takes much of his time, as does the cutting or blowing out of seized shafts and bearings.

The *Tribune* gives its weldors good equipment and lots of it with one purpose in mind: to keep presses in top-notch operating condition. And so far, weldors like John Montgomery are doing just that.

BEFORE: Steps before press plate cylinders obstructed aisles even when "stowed away", caused many minor accidents

AFTER: Weldor Montgomery demonstrates his movable welded step model which allows greater space, reduces hazards

BRAZE-welding process is used to rebuild a broken gear tooth. Low brazing temperatures reduce residual stresses and danger of cracking



BROKEN water-pump case is repaired by braze-welding, which will not embrittle cast iron. Areas braze-welded are always machinable

IN THE JOB SHOP...

Braze-welding rods are all-purpose tools

BY JOSEPH IMPERATI*

—*Photos courtesy Linde Air Products Co.*

CRACKED gear ring from a large power shovel is given a braze-welded repair. Weld strengths of 50,000 psi or better are not unusual, giving welded areas a strength equal to or greater than the base metal

ANY discussion of copper and brass in the job welding shop must deal largely with the uses of familiar oxyacetylene braze-welding rods. These rods have become the mainstay for a wide variety of fabrication and maintenance purposes.

By contrast, the copper, copper-silicon alloys, phosphor bronzes, cupro nickels, and aluminum bronzes are usually limited to welding their respective base metals. They are limited also to surfacing steel in the fabrication of pressure vessels and equipment for chemical and process industries.

These braze-welding rods are much alike in that they are modifications of the standard 60-40 copper-zinc alloy rod. The chief differences are in the special alloying ingredients, which are very small in amount but which have a marked effect on performance of the weld rods, and on quality of deposited weld metal.

The naval brass type has about 1% of tin added to improve its strength. Manganese bronze types have up to 1% each of tin, manganese and iron added for improved strength, hardness and wear resistance.

The low-fuming bronze is actually a superior manganese bronze, for in addition to the other elements it carries up to 0.25% silicon. This addition, which effectively suppresses vaporization of zinc and makes it low

*Anaconda Wire & Cable Co. From a talk given by Mr. Imperati at the University of Iowa.

fuming, also results in reduced porosity and noticeably increased physical properties in the weld metal. It is the chief reason for the wide popularity of this type of rod.

Nickel Silver Rod

A related rod class, also used mainly for braze-welding purposes, is the nickel bronze or nickel silver type. In this Alloy, 10% nickel is substituted for some copper and zinc.

The result is a silver-colored metal useful for color-match welding on steel, iron and the nickel silvers. In addition, it is reported to have better wear resistance than the yellow bronzes.

As is the case with all other standard products, these braze-welding rods are covered by industry and consumer specifications, such as those of the federal government and the American Society for Testing Materials.

ASTM Specification B259 (AWS 5.7-52T) classifies them on the basis of chemical composition and mechanical properties, and is a dependable guide to the performance and weld metal quality to be expected from them.

Versatility of braze-welding rods stems from well established advantages, the most important being their relatively low melting temperatures. Required temperatures range from 1,600 to 1,700 F, are indicated by moderate red heats, and are always below the melting points of the metals on which they are used.

Eliminating Distortion

Weld metal, therefore, is easily controlled and can be applied without difficulty in all positions. Low brazing temperatures develop only low residual stresses, so distortion is reduced and the danger of cracking is virtually eliminated.

An important point in the repair of cast iron is that braze-welding temperatures do not embrittle it, and brazed areas are always machinable. Molten alloys also bond very easily to heated surfaces of most metals and develop exceptionally high bond strength.

Strengths of 50,000 psi or better are not unusual, so the welds are usually equal to or higher than the strengths of the base metals on which they are used. It is easy to build up good fillets with them, which further improves the strength and appearance of the joints.

Braze-welding rods are regularly supplied bare and are most commonly used with powdered fluxes. An efficient way to use the flux is to dissolve it in boiling water and paint it onto the cleaned rods.

This leaves a thin coating that sticks well and eliminates the need for dipping rods into dry flux. On all metals except cast iron, it is advisable to flux weld areas, too, *before heating is started,* in order to avoid producing oxides which may not be removed by the flux added afterwards.

Flux Coating

Here, also, better fluxing is obtained by painting a thin wash on the cleaned weld areas, and this can be done with the hot water and flux mixture described, or with one of the commercial liquid and paste fluxes.

Braze-welding rods with heavy flux coatings are available from some suppliers. However, as stated before, it is not advisable, when welding metals other than cast iron, to depend only on the flux coating.

Probably the most familiar use of braze-welding rods is in the repair of broken cast iron. Jobs of this type range from extremely large ones like press beds and rolling mill frames, to such small items as lawn-mower wheels and pipe fittings.

The reasons for the widespread acceptance of braze-welding for use on cast iron are:

(1) It is the easiest and fastest method.

(2) The ductility of bronze insures against recurrence of failure in service.

(3) Residual stresses are low enough to prevent further cracking during welding and cooling.

(4) It is the only welding method that does not change the properties of malleable iron.

(5) The joints are machinable.

The preparation of cast iron is not critical. Fractures should be opened up by chipping, filing or grinding to make vee-grooves with included angles of about 90 deg. Surfaces should then be cleared by wire brushing.

Clean Oily Surfaces

Oily surfaces should be cleaned with a suitable solvent, and oil-soaked castings must be preheated long enough to drive off oil before welding is started.

Grinding or machining may leave graphite on surfaces which will interfere with the "timing" of the bronze, but this graphite can readily be removed by heating to a dull red for a few seconds before welding.

Powdered braze-welding fluxes are suitable and should be applied generously as soon as heating is started. Occasionally, a casting is found that is hard to tin, as in the case of boiler and radiator sections. Special oxidizing fluxes are available to help the bronze flow and adhere to these irons.

The technique of braze-welding is relatively simple. It requires only that the work be heated to a dull red temperature, and that a small quantity of bronze be melted on to it. Then, as heating is continued, the bronze will automatically flow out and tin to the iron when the porper temperature is reached.

Once a section is tinned, more bronze is added to build up the deposit as needed, then the flame moves ahead to repeat the process of tinning and building up.

In building up welds, it is necessary to re-melt the surfaces of previous layers in order to secure complete fusion. Essentially the same technique is used to make the tack welds, except that welding is here restricted to smaller areas.

Prevent Excess Heat

It is both wasteful and detrimental to heat much beyond the temperature needed to make the bronze flow. Excessive heating will vaporize zinc from the bronze to produce heavy fumes, and will oxidize the iron so that bronze will not adhere to it.

BRONZE bell was given braze-welding treatment for a large crack

MOST familiar use of braze-welding rods is in repair of broken cast iron. Here, a hay-rake spider has broken collars welded on arms

To help avoid overheating, the torch tip should be large enough to do its work without applying the white inner cone of the flame directly to the bronze. Preheating of large castings, therefore, helps to prevent overheating.

When the weld is completed, it should be allowed to cool slowly to avoid development of high stresses. It is helpful to cover the work with asbestos to protect it from drafts; however, no heat-treatment or peening is needed to insure machinability and freedom from stresses.

Preheating often is employed in braze-welding iron castings, and is usually done by auxiliary torches burning oil or city gas. It is required only when: *(1)* the castings are so large that it is impossible to get required heat with welding torches only, and *(2)* the castings are of such shape — wheels, pulleys, gears — that expansion and contraction may develop new cracks.

However, preheating is helpful on all castings because it reduces the temperature difference between weld and base metal and therefore reduces stresses left in cooled castings.

Used in Rebuilding

Braze-welding is also used for rebuilding worn bearing surfaces and broken gear teeth. The procedure is the same as for repair welding of broken castings. Of course, there is no need to remove metal as in the case of fractures, but surfaces must be free of oil, dirt and scale.

For applications requiring exceptional wear resistance, a special surfacing bronze is available which has a higher tin content than reguler yellow bronze rods.

Another well-known use of braze-welding rods is in joining steel tube, rod and bar, and sheet metal, for repairs and in making a wide variety of everyday items. On steel, it is necessary only that weld areas be cleaned of dirt, grease and scale, and be fluxed before welding.

Bronzes flow to heated surfaces with no difficulty, and welds are easily built up to required contours in all positions.

Typical job shop products made of braze-welded steel are benches, racks, wheeled trailers, ductwork, special tools, ornamental home furnishings, and pipe structures like antenna towers, fence gates, ramps, and playground equipment. Repairs are regularly made on items ranging from small hand tools to automobile and truck parts.

Automatic Fluxing

Braze-welding of many mass-produced items of steel, such as tanks, furniture and automotive components, is expedited by the use of automatic fluxing. This is accomplished with a flame-fluxer installed in the acetylene line, which provides a container for a volatile liquid flux and a vapor chamber through which acetylene is passed.

By this means, acetylene picks up a uniformly metered quantity of vapor flux which is deposited wherever the torch flame impinges. Production is speeded by elimination of both the separate fluxing operation and the extensive weld cleaning usually required.

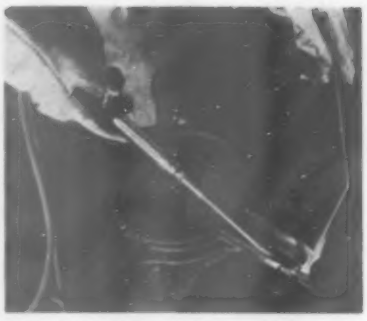
A minor wire-brushing operation is all that is needed to remove the very small amounts of flux remaining, and to prepare welds for painting.

In addition to joining iron and steel, the job shop finds braze-welding rods useful also for repair welding many items of copper, bronze, brass and the nickel alloys. Here again, their value lies in the comparatively low temperatures at which they melt, and the ease with which they flow and bond to moderately heated surfaces.

It is only necessary to see that surfaces are clean and fluxed before heating. Fluxes used for iron and steel are also suitable for these applications.

ROD CLASSIFICATIONS

Rod Type	ASTM-AWS Class
Naval brass	RCuZn—A
Manganese bronze	RCuZn—B
Low-fuming bronze	RCuZn—C
Nickel bronze	RCuZn—D



TECHNIQUE of braze-welding is relatively simple. This snowplow is a home-made affair, its braces being braze-welded to tractor

Copper Alloy Rod

Another well-known copper alloy welding rod which has been found useful for job welding is the copper-silicon type. It is often used with the carbon-arc process for welding light-gage plain and galvanized steel.

In addition to spatter-free welding, it offers excellent control of arc and weld metal and less distortion than with other methods. On galvanized steel it minimizes the disturbance of the zinc coating, and makes joints that are practically non-rusting. For this reason, it is widely used in the fabrication of air-conditioning ductwork.

Welding is done with straight-polarity direct current, and with pointed graphite electrodes. The welding rod is kept on the joint so the arc always plays on the bronze and not on the steel. This is necessary because good results can be obtained only by braze-welding to the steel without melting it.

To insure this, puddling of the weld cannot be tolerated, the arc must be kept as short as possible, and weaving must be restricted to the very minimum.

The braze-welding process has developed into the all-purpose tool of the job welding shop. It is certain to remain of major importance so long as iron and steel are used in manufactured products.

Wider inspection usage as . . .

X-ray units go to the welds

Radiography for weld inspection was hampered by size of equipment . . . when weldments were too large to bring to the large X-ray units, other means of detecting flaws had to be found. Now, with portable units on the market, X-rays can go to the welds.

SHORT exposures and easy handling are outstanding features of this and other similar portable X-ray units. This tube, with short focus-film distance, will penetrate up to 1¼ in. of steel

OF ALL the various non-destructive methods for testing welds, none is put to greater use than X-ray inspection.

One example can be found in the shipbuilding industry. The rules of the American Bureau of Shipping now allow the substitution of radiography for trepanning of plugs from welds in the hull.

Even where spot checks only are required, it has been found that X-ray inspection is preferred.

Several manufacturers of portable X-ray equipment have products that can be used to run the inspection gamut from small spot welds to plate thickness of almost 3 in. Many of the units are capable of 360-deg sweeps, and this ability to check a circumferential weld with one exposure has contributed greatly to their popularity.

Inside-Out Views

Also, many items can be set up in a circle around the X-ray head of such machines and be radiographed at one time.

This type of unit usually can be placed inside a pipe or pressure vessel to take "inside-out" views. One manufacturer claims his instrument will penetrate 2⅛ in. of steel and traverse a pipeline greater than 12 in. in diameter.

CAPABLE of producing a 360-deg radiation sweep, this 185-lb unit can be placed inside a pipe to take inside-out X-ray views

Not all of the portable X-ray machines are capable of "shooting" complete circumferential welds. Many are designed just for examination of welds at short, focus-film distance. However, the former type also can be used in the same manner as the latter.

Portable though they may be, some of the units are too heavy to be lifted easily by one man. Weight of the tube heads ranges from 75 lb. to a heavy 185 lb. Control panels may weigh anywhere from 60 to 145 lb.

Generally speaking, X-ray units capable of 360-deg exposures are the heavier ones. The same holds true for their control panels.

Considering their comparative sizes, these machines are rather powerful. Here are some typical ratings:

Two units made by different companies have identical potential ratings of 120 kilovolts, 5 megamperes; another is rated at 180 kvp, 10 ma; and a third at 160 kvp.

Most of these portable X-rays operate from standard 110 or 220-volt power supplies.

Pipeline Inspection

Widespread application for such non-destructive testing is found also in the petroleum industry, where X-rays are used for inspecting welds in pipelines, tanks and pressure vessels.

In the shipbuilding industry, portability is of utmost importance for X-ray work on board a ship under construction. A. K. Hutton, of the Newport News (Va.) Shipbuilding & Dry Dock Co., in a paper presented last Fall before the Society for Non-Destructive Testing, had this to say about his firm's use of portable equipment:

"We have tried 250-kv machines, but with little success because of weight consideration and lack of rugged qualities. It is now reported that lighterweight equipment of this voltage is under development.

"If it is to be of service, it must have sufficient built-in sturdiness to withstand handling on a ship under construction. At present, we are using machines from 170 kv down to 120 kv . . ."

Mr. Hutton's company took more than 4,000 separate radiographs on the *U.S.S. Forrestal* and a similar number on the *U.S.S. Ranger*, the United States' newest aircraft carriers. On the superliner, *United States*, more than 2,500 radiographs were made.

As a manufacturer of pressure vessels once said, "It is a mistake to regard non-destructive testing, particularly the X-ray method, as merely a means of finding flaws. It is also a valuable means of preventing flaws."

And the introduction of portable X-ray equipment for industrial radiography has helped extend this means over a wider range of products.

"MIRACLE House" makes liberal use of welded steel. Modern home is located on Chicago's far West Side

$150,000 welded wonder

BY F. T. TANCULA

A WELDED steel house located on Chicago's far West Side is attracting a great deal of attention these days . . . and little wonder!

Modern in style as well as in construction, the "Miracle House," as it is called, is valued at $150,000. In addition to the liberal use of welded steel, specifications for the quadri-level house called for 900 sq ft of glass, 720 sq ft of porcelain-enameled panels, terrazo floors, radiant heat, air-conditioning and illuminated safety stairs.

Two huge, rigid-frame box beams, fabricated from ½-in. steel plate, are the basic structural members, and each weighs almost 20 tons. In addition, about 15 tons of steel panel framing went into the house.

Arc welding was used extensively in both the shop and on the construction site. The large steel members were fabricated by the Midland Structural Co., a division of Allied Structural Steel Cos., Hammond, Ind. They were then trucked to the building lot.

E6013 Electrodes Used

As shown in the accompanying photographs, each box beam consists of a long arch welded at each of its ends to a column that angles away from the center of the building. These arches measure 78 ft from tip to tip along the chord.

More than 600 lb of E6013 electrodes were consumed in the shop. Diameter sizes were 3/16 and ¼ in. Welding current was supplied by six 400-amp, a-c machines.

All welding was done in the flat, downhand position. The welds consist of continuous beads—there was no intermittent welding on the beams. Plug welds, however, were laid down along the length of the seams to tack members together before final welding operations.

Shop welding (about 4,000 linear feet) comprised 75% of the metal joining found in the house. After grinding and painting, the box beams were shipped to the Chicago location.

About 2,500 more linear feet of welding was required on the construction site. Here again, E6013 electrodes were used, and about 300 lb were consumed.

Diameter sizes used in the field were ⅛, 5/32, ¼ and ⅜ in. Current was supplied by a 300-amp, gas-engine drive welder, and welding in all positions was employed during final construction work.

The "Miracle House" literally hangs from the two rigid-frame beams, and this necessitated welding various hanging channels and frames. To these were welded the steel panels that, with the great amounts of glass, constitute the outer walls. Steel purlins which help form the roof were also welded.

The base for the terrazo floors, as well as for the ceilings, consists of 13-gage steel pans that vary in length from 12 to 24 ft. These pans were joined intermittently with 4-in. welds, 2 in. apart (centers of welds 6 in. apart).

A lightweight aggregate was used to fill spaces between the floor pans.

Four construction companies cooperated on the job site: R. Gatwood, which handled most of the welding, Kenwood Construction Co., Gateway Construction Co., and New City Iron Works, all of Chicago.

Unique Structure

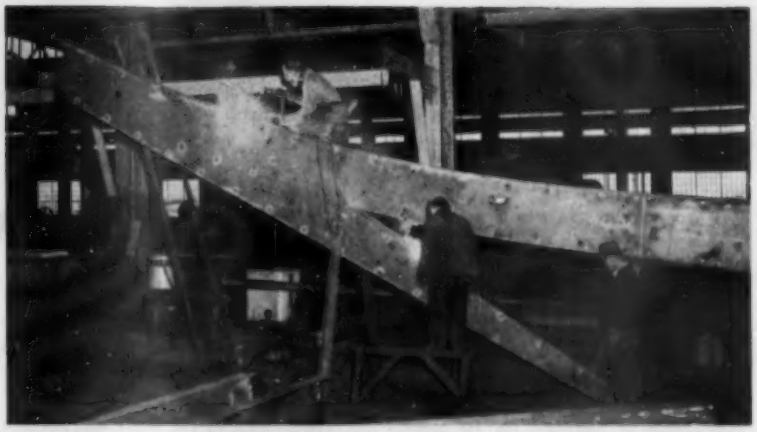
Said to be the only one of its kind, this completely furnished dream home was erected for the purpose of raising funds for St. William parish, Chicago. It is scheduled to be occupied next month. The Rev. Frank Ciesielski of St. William's conceived the idea of the "Miracle House."

According to Chicago architects Belli & Belli, steel was used in preference to prefabricated concrete because of the former's flexibility and its speed and ease of construction.

Fabrication of the two rigid-frame box beams by welding made them 20% lighter. In addition, welded construction of the beams, which form the foundation of the entire structure, is said to make them about 95% more durable than any other method of suspension.

Here, indeed, is a "welded wonder."

Welded houses have been described in the pages of WELDING ENGINEER before, but never one like this! Luxurious and modern, it uses steel generously and with imagination.



1—MAIN shop-welding job consisted of joining 1-in. steel plates to form rigid-frame box beams. Weldor "rides" an upside-down half of one of the arches

2—WELDOR joins plate at seams after plug welds have been made to tack members together

3—STEEL skeleton of four-level house. Note how it hangs from beams. Arches measure 78 ft across chord, and two beams are basic structural members of house

4—ABOVE: Another stage of construction. Here steel wall panels have been welded in place and stone fence built around patio

5—RIGHT: Base for floors consists of 13-gage steel pans joined with 4-in. intermittent welds

Through resistance and other processes . . .

1955 Ford bodies have a multitude of welds

FORD Division of Ford Motor Co., seeking higher quality and faster, more economical production, completely altered certain major welding operations throughout its 16 assembly plants for its 1955 car model program.

Ford Division's Manufacturing Engineering Department developed two new multi-electrode press welding machines for use in manufacturing the dash-panel and underbody (floor pan) assemblies of 1955 passenger car models.

Ford manufacturing engineers thik the design of this press welder is unique in the auto industry. It has the lowest height of lower platen —30 in. from the top of the lower platen, in down position, to floor level—for a four post under-drive press. It has a 52-in. opening between platens with an 18-in. stroke of lower platen to welding position.

The design of the drive mechanism is simple and requires little or no maintenance. It uses chain drive and sprockets attached to toggle links for a positive lockup of the lower platen in welding position.

This means a constant torque is applied to toggle links, giving a smooth and fast platen action. The press is designed for maximum strength, minimum weight and for minimum initial building cost.

Fixture Design

This type of equipment can be adapted for varied volumes of production. The fixture design of the multi-electrode welder eliminates the necessity for numerous individual, portable welding guns, each requiring a transformer and control panel.

The dash-panel press welder frame and controls can also be used for several car model change programs. This C-type press welder is a variation of design on the standard C-type press welders which serve as workhorses for other divisions of Ford.

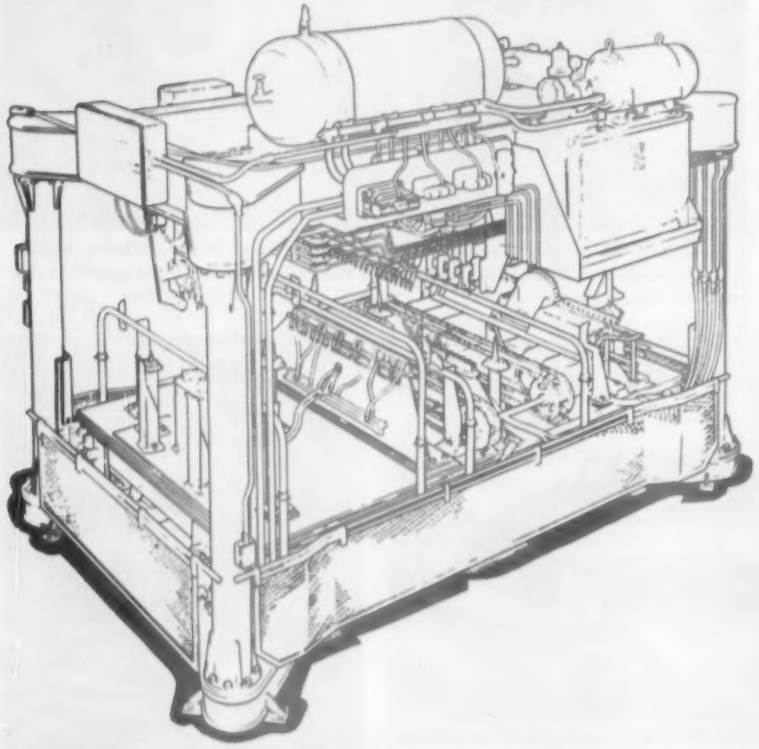
Complete air operation of all press and fixture movement requires minimum maintenance.

With installation of the multi-electrode press-welding equipment, Ford claims it is achieving:

(1) Higher quality of work because all welds are uniform;

(2) Higher production because a bank of work is continually maintained behind the welder to feed into the production line if and when a press welder has to be shut down for maintenance or repair;

(3) Long range benefits because the press welders are designed to build any conventional floor pan or dash panel assembly that Ford is likely to develop for many years.



GENERAL schematic diagram of one of the new multi-electrode press welders which handles dash panel and floor pan assemblies for 1955 Ford passenger car models

Many Body Changes

Because of body construction changes in its 1955 passenger line, Ford decided to provide new fixtures. These body changes include a wrap-around windshield. Also, the front door window area was shortened considerably because of the windshield. The tail-light area was completely altered.

One model was discontinued and two new models were added.

This new styling and changes in contours and major dimensions of the car made it mandatory that Ford either rework its fixtures or build new tools. Rework was not feasible because of time and expense.

New fixtures, therefore, were designed and built, giving the com-

pany an opportunity to provide greater assembly flexibility, which was accomplished by designing reversible types of locators into the framing fixtures.

These locators permit the assembly of more different body types in one fixture, and also let the company fit one of the new model bodies into the assembly pattern without the expense of designing separate framing fixtures.

Last September, Ford Division called in from its assembly plants those plant engineers, manufacturing engineers, maintenance people and all others who would be concerned with the use of press welders. The company held classes to define the proper installation and use of the machines.

Manuals describing operating instruction, tooling and equipment requirements, planning layouts, pictorial body illustrations, scale cross-sections and welding gun applications were distributed.

DIAGRAM of floor pan assemblies indicates the amount of resistance welding done on each

Welding Sequence

The control sequence of the right-hand machine follows.

To begin the operation, the platen is in down position and all electrical lines, switches, etc., are inactive.

By closing the initiating disconnect switch, the electrical current energizes the timer which becomes ready to operate.

Pressing the pump start button starts the hydraulic pump meter. The parts are then loaded.

With pressing of the cycle start button, current to the hydraulic-control valve starts the action of the hydraulic cylinder that motivates the raising of the platen, carrying the fixture and material to be welded into "up" or weld position.

The air-control valves are energized so that the air gun cylinders extend the electrodes against the material while the stationary buttons on the other side complete the necessary circuit. This is known as the "delay" or "squeeze time" which is the interval necessary for the welding-gun electrodes to close, under pressure, upon the material to be welded.

The timer then starts the next interval or cycle, known as the "welding time," by energizing each welding contractor and its associated group of welding transformers. The transformers in turn allow the current to pass through the electrodes and buttons, heating the material at point of contact.

Current Reduction

These transformers are controlled so that rapid succession firing is done in phases and cascades. Thus the heavy drain of current, which would exist if all guns fired at once, is reduced.

During the "hold time" the current ceases to flow through the electrodes and a rapid cooling takes place. The air pressure continues to force the electrodes against the material for a length of time sufficient to weld the parts together.

In the next step, the initiating action of the "off time" begins with retracting the welding guns by re-energizing the air-control valves and reversing the air circuit. Hydraulic valves that control the indexing cylinders are energized at this point, so that the guns are shifted to weld in a second position.

A repeat of the squeeze time, weld time, hold time and off time cycle takes place, completing the welding sequence.

The last sequence follows with the same action, except that during off time the platen is lowered by reversing action of the hydraulic press-up cylinder. On the platen's downward stroke, the completed underbody assembly is stripped from it. The hydraulic valve that operates the ejector mechanism is energized, thereby starting the action that pushes the completed assembly from the machine.

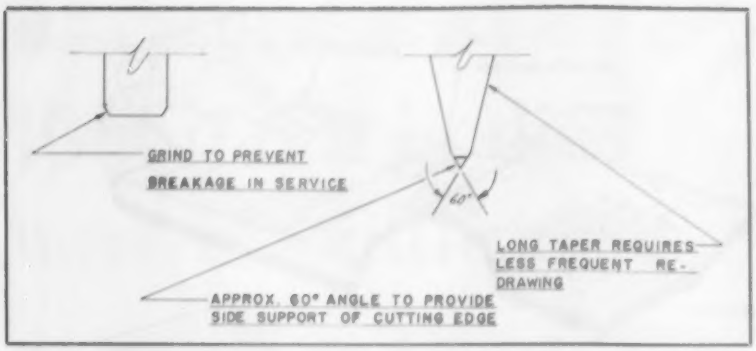
The ejector mechanism then returns to its original position, allowing the operator time to reload for the next complete sequence.

Ford says a unique feature of the machine is that its lower platen, which travels 18 in., rises to meet the upper platen. Ordinarily, the lower platen is fixed. This arrangement takes most of the equipment off the floor because it is mounted overhead; thus it permits better maintenance.

In operating the press welder, one of two operators manually feeds into it sections of the underbody or dash-panel assemblies. An automatic ejector throws the completed assembly either to the right or left, depending on the location of the conveyor. The machine itself can be rotated to eject either to the right or left.

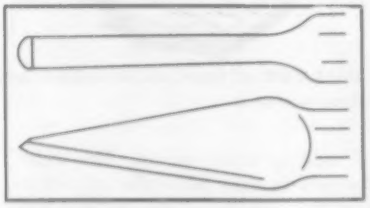
These machines are said to weld more than 100 assemblies an hour as compared with the current rate of press welders at the Dearborn assembly plant of 69 on hour average.

The press welders were built to Ford specifications.



The care and feeding of cold chisels

BY WILLIS G. GROTH



TOP and side views of the most common form of half-round chisel

THE cold chisel is one form of man's oldest tool, the wedge. It can be classed as an edged tool, since it is usually sharpened to increase its efficiency and range of applicability.

The term "cold" chisel applies to those chisels intended for cutting machineable grades of engineering metals at room temperature. They are not ordinarily adapted to cutting these metals at elevated temperatures (unless the chisel is made of an alloy which retains its cutting edge at a high working temperature—an unwarranted expense for most chisel requirements).

Cold chisels take several shapes and many edges, depending upon their uses and the whims of workmen maintaining them. The basic chisel is ordinarily used for cut-off of cold mild-steel sections.

A variation may retain an approximate 60 deg nose angle, but curves the transition into the principal taper. The nose angle may be increased for cutting very hard alloys, and decreased for cutting soft alloys. The angle for cutting soft aluminum or copper might be only 30 deg.

Occasionally, it is found desirable to grind for a slight edge curvature to prevent corners from gouging when smoothing a relatively flat surface. When severing a bar with this type of chisel, it is advisable to proceed as follows:

1. Make initial notch with only a short portion of the cutting edge.
2. Continue across bar to get initial groove, then repeat until bar is severed.

Blacksmith's Chisel

The basic chisel is commonly used for routine blacksmith shop jobs. A used for preparing plate edges and specialized version of this chisel is removing weld reinforcement.

Here the problem is one of removing a chip. To do so, one must be able to guide the chisel to control chip size and shape, and the chisel must be ground to resist successfully the large bending forces necessary to form this chip.

Chisel No. 1 is obviously useless since it requires a large attack angle and very large forces to feed the blunt nose. This chisel also has a bad tendency to "jump out."

Chisel No. 2 is less blunt, easier to start perhaps, but may suffer damage if the edge is too thin. Depth of cut will be difficult to control since the nose angle is fixed and constant and the chisel is very sensitive to slight variations in feed angle.

Chisel No. 3 will enter the work easily, but since the cutting edge is unsupported on the under side, the edge will easily be turned or broken. Grinding a chisel in this manner is the surest way of ruining it.

Chisel No. 4 can be ground to provide a good "bite," good control, a curved chip and excellent edge life. The curved portion of the lower face is perhaps ½-in. long, and the edge about 1/16 to ⅛ in. from the original straight side. The edge-included angle may then vary from 30 to 60 deg, depending on metal being cut. This is the recommended chisel outline for edge preparation of plate and for finishing welds.

Special Chisel Forms

Special chisels include cape, half-round and diamond point. A cape chisel is narrow-bladed, with the widest point at its cutting edge to prevent wedging in grooves. This chisel should never be ground on its sides.

The cape chisel is used where a narrow blade is required, and may be used for an initial cut—right down the center—when excessive reinforcement must be removed from a wide weld bead. A flat chisel will then span each half of the bead to complete chipping.

The most common form of half-round chisel is sharpened by grinding the sloping face and, sometimes, dressing the curved underside. *Never* grind the point or cutting edge on the *flat sides*, or try to make too small a radius on the lower curve—this will cause the chisel to wedge in grooves. The half-round chisel, in various sizes, is widely used in vessel shops to remove weld defects and back chip joints.

The diamond-point chisel requires a slight curvature to both under-surfaces on the cutting end for best results.

Care in Tempering

The gouge is a curved chisel for making wide, shallow grooves, and it too does its best work when ground with a slight curve on its lower leading edge. The flat sides behind the cutting edge should again be left unground to prevent wedging.

The general shape of a chisel is secured by forging. Following hardening, usually with oil, the edge is

For 50 Years... Sold the World Over

FIBRE-METAL HELMETS

THEY'VE HAD TO BE GOOD!

● The name FIBRE-METAL stands for highest quality... *quality* preeminent in the field of welding... based on broadest experience and continuing research to produce the kind of equipment that gives maximum protection to the welder... along with the comfort and "work ability" that enable him to produce more work per day.

FIBRE-METAL HELMETS: *First with Fiberglas!**

No. 600-3-C
No. 602-3-C

No. 604-3-C
No. 606-3-C

No. 700-3-C
No. 702-3-C

Inside view showing INNER RIB of "Series 600" Helmets for extra protection to welder's neck from flashes and reflected glare.

*OWENS-CORNING TRADE MARK

No. 400-3-C with #1130—Plastic Glass Holder
No. 402-3-C with #1085—Insulated Steel Glass Holder

No. 404-3-C with #1136—Plastic Lift-Front Glass Holder
No. 406-3-C with #1096—Insulated Dowmetal Lift-Front Glass Holder

NEW "Series 400" Helmets

The smaller size and light weight of the Fibre-Metal Series 400 Helmets make them ideal for close quarters. They feature Fibre-Metal's superior Fiberglas* compression-molded shells, Beaded edges for strength and safety, Wide Range Headsize Adjustment, New 4-Position Helmet Stop, and provide four popular glass holder styles. Adjustable friction joints hold helmet in any position!

HELMET FEATURES:

LIGHT WEIGHT • EXCEPTIONAL STRENGTH • MOISTUREPROOF NON-WARPING • HEAT RESISTANT (SELF EXTINGUISHING) EASILY STERILIZED

OVER 30 TYPES TO MEET YOUR NEEDS

When buying any welding equipment... always ask for a FIBRE-METAL product!

FIBRE-METAL

WORKER SAFETY PAYS DIBIDENDS

Sold Everywhere thru Leading Distributors and Dealers

THE FIBRE-METAL PRODUCTS CO.
CHESTER, PENNA.

Welding Engineer

Shooting for the Welding Market?

If you are, you will want to keep in mind
WELDING ENGINEER'S monthly calendar of events

WELDING ENGINEER, the world's oldest and best-read welding publication, is aimed at the more than $500,000,000 welding market.

Readers with buying power plus its editorial quality make WELDING ENGINEER "hit the bullseye" for those who want to sell to users in the welding market.

Only in WELDING ENGINEER do you have audited "job title" subscribers, and they read *WELDING ENGINEER.*

Readership studies show that the average subscriber spends 2 hours and 6 minutes reading each issue.

Only in WELDING ENGINEER do you have buying-power sales leads. Of all such leads handled by our reader's service department, 74% have come from readers with the title of "foreman" or better—this proves buying power!

WELDING ENGINEER will not only continue to provide its subscribers with top-quality editorial matter designed for easy reading and thorough understanding, but it will also place emphasis during the next 12 months on these events.

To make the most of these events (so important to the welding world) and to capture your share of the welding market, you should be in these oustanding issues of WELDING ENGINEER.

Closing dates for the:

Metal Show Issue, September 5
40th Anniversary Issue, December 5

Make your SPACE reservations NOW!
Write, wire or phone

COMING EVENTS

OCT. 17-21: National Fall Technical Meeting, American Welding Society, Bellevue-Stratford Hotel, Philadelphia.

OCT. 17-21: Thirty-seventh Annual National Metal Exposition and Congress, Convention Halls, Philadelphia.

JAN. 1, 1956: Fortieth Anniversary of WELDING ENGINEER.

MARCH 12-14: Fifty-sixth Annual Convention, International Acetylene Association, Hotel Statler, Los Angeles.

MARCH 19-22: Twelfth Annual Convention, National Welding Supply Association, Hotel Roosevelt, New Orleans.

MAY 8-11: Thirty-seventh Annual Meeting, American Welding Society, Hotel Statler, Buffalo.

MAY 9-11: Fourth Annual Welding Show, Memorial Auditorium, Buffalo.

Coming . . .
these special issues of
WELDING ENGINEER

October, 1955—Annual Metal Show
January, 1956—40th Anniversary
March, 1956—Annual Distributor Issue
May, 1956—Annual Welding Show
Mid-June, 1956—14th Fact File Issue

EASTERN DISTRICT
Herman C. Phelps
P. O. Box 128
White Plains, N. Y.
WHite Plains 9-3876

MIDWEST DISTRICT
Warren Ware
12 East Grand Ave.
Chicago 11, Ill.
DElaware 7-0339

WESTERN DISTRICT
Ted B. Jefferson
12 East Grand Ave.
Chicago 11, Ill.
DElaware 7-0339

WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill.

drawn or tempered (some chisel steels do not require tempering).

If tempering is necessary, avoid excessively high temperatures which soften the cutting edge, making it worthless. A temperature of approximately 375 deg will usually prove sufficient.

In grinding, also, the chisel edge must not be overheated. Dip it in water frequently, and use very light pressures. Once the cutting edge has been overheated (evidenced by a blue color), there is no recourse except re-hardening and tempering. Grinding off the blue oxide merely conceals the damage.

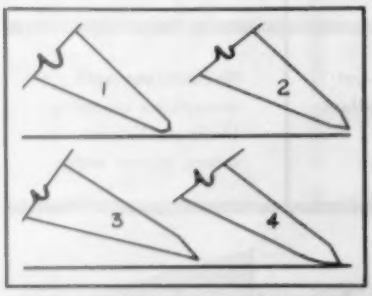
More chisels have been ruined by grinding than by shop use.

The principal concern of most fabricators today is with pneumatic, rather than hand power. In this case, remember that the gun must be kept at the chisel shoulder. Inexperienced operators sometimes find this difficult, but for full power the chisel must be properly seated in the gun or hammer.

It is usually helpful to lubricate the chisel by dipping the cutting edge occasionally in a can of oily waste. This speeds cutting and helps transfer heat from cutting edge to workpiece. It also leaves an oil film that may cause difficulty in welding, so proper cleaning afterward is very necessary.

Every impact (and there are approximately 2,500 per minute) causes a temperature rise in the chisel due to a hysteretic loss of impact energy. If the chisel is too deeply imbedded to drive further, all of the energy will be turned into heat, principally at the chisel edge where it is bouncing against the workpiece.

As long as the chisel is moving there is little damage. So be sure your chisels are "well fed."



FOUR of the many ways in which basic blacksmith's chisels can be shaped—yet only one method is correct

Save costly replacements

...get fast, strong repairs with Bridgeport No. 192 Low-Fuming Bronze Rod

This scale was a vital link in a plant's materials weighing section. Operations slowed down when its cast iron frame was smashed. Braze welding with Bridgeport No. 192 Low-Fuming Bronze Rod had it back on the job good as new in a matter of hours . . . another example of time and money saved through repair with braze welding.

Bridgeport No. 192 is a low-fuming manganese-type, all-purpose rod recommended for both repair and production welding. It tins readily and the base metal needs relatively little local preheating, thus avoiding brittleness. Many repairs are possible without disassembling or moving heavy equipment. And welds are frequently stronger than the base metal.

Write today for your free copy of Bridgeport's new booklet, "Bronze Welding Alloys."

BRIDGEPORT BRASS

Bridgeport Brass Co.

Offices in Principal Cities • Conveniently Located Warehouses

Bridgeport Brass Company, Bridgeport 2, Connecticut

In Canada: Noranda Copper and Brass Limited, Montreal

BRASS • BRONZE • COPPER • SHEET • ROD • WIRE • TUBE
ALUMINUM EXTRUSIONS AND FORGINGS

Your guide to LOW-COST WELD GRINDING

Reducing heavy weld with CARBOFLEX Depressed Center Wheels

	CARBOFLEX Depressed Center Wheels	MX® Depressed Center Wheels	MX® Discs
RECOMMENDED USES	Heavy weld Removal, Portable Cutting-off, Slotting	Light and Medium Weld and Flash Removal, Rough Blending Flat Surfaces	Light Weld and Flash Removal, Blending and Semi-finishing Flat surfaces
RATE OF CUT	Fast on undercutting welds, cutting off and slotting	Fast on welds and flash—medium on flat surfaces	Medium fast on light welds and flat surfaces
OTHER ADVANTAGES	Rigid—strongly reinforced for maximum safety	Slightly flexible—yet strong, safe. Excellent for work on soft metals and alloys	Flexible, yet rigid enough for cleaning channels, interior seams, corner welds

...continually putting more sense in your abrasive dollar

Grinding and finishing weld bead with PORT-A-BELT Grinding Attachment

Smoothing seam of welded aluminum casting with MX Disc

RESIN SANDER Discs

Light and heavy Weld Removal, Blending and Finishing contours and flats

Fast stock removal on all surfaces

Flexible—depending on sander pad used. Low cost—long life

Economical weld grinding begins when you choose the right abrasive product to do the job... from the complete line by CARBORUNDUM. Four of the most widely used types are charted here. There are many others... such as cup wheels, straight wheels, rubber-bushed wheels, PORT-A-BELT Grinding Attachments, etc. Each has its place—each does one or more weld grinding jobs faster, more economically than any other tool.

YOUR CARBORUNDUM Salesman or Distributor offers expert counsel, prompt delivery of the right abrasive product at the right time. Call him.

THE CARBORUNDUM COMPANY, Dept. WE 81-57, Niagara Falls, N. Y.

Please send: ☐ Folder on CARBOFLEX Depressed Center Wheels
☐ Booklet on MX Abrasive Products
☐ Folder on PORT-A-BELT Grinding Attachments
☐ Information on_____

NAME

COMPANY STREET AND NUMBER

CITY ZONE STATE

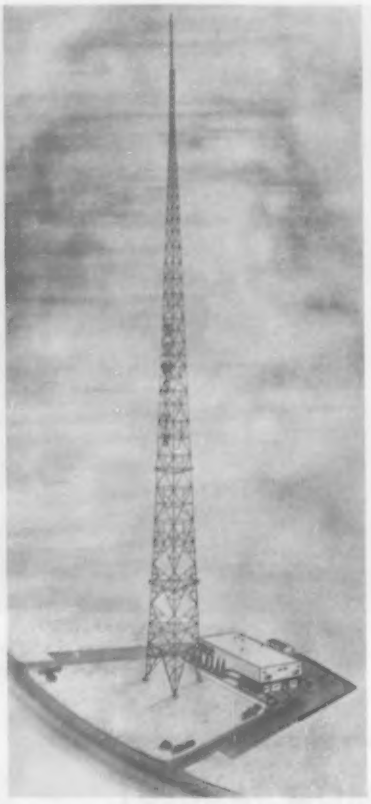
CARBORUNDUM

REGISTERED TRADE MARK

81-57

SHORT section of one triangular tower leg is jigged and tack welded. Tower is being fabricated at operating site for initial transmission on September 11

842-ft TV tower has welded strength



ARTIST'S sketch of completed tower gives some concept of overall 842-ft height

A NEW, all-welded television transmission tower, believed to be the second tallest, self-supporting tower of its kind presently in use in the country, is now being engineered and fabricated by the Dresser-Ideco Co. of Columbus, Ohio, for that city's WBNS-TV station.

GROUNDWORK for tower is laid as concrete is poured into one of the base supports

Overall height of the tower, which is also to be erected by Ideco, is 842 ft. The tower proper is 764 ft, and is surmounted by a 73-ft antenna which weighs 8,000 lb. A 1,000-watt beacon is mounted on top of the antenna.

The tower, triangular in design, has a base which measures 70 ft on each side. Three reinforced concrete slabs comprise the base. Individually, these slabs are 17 ft square and 4 in. thick. Each slab rests on 30 steel pilings which have a weight capacity of 30 tons apiece.

The foundation, started on April 25 this year, contains 164 cu yd of concrete.

Welding Fabrication

Tower "legs" and component beams and angles are being jigged in short sections and tack welded with E6016 electrodes. All single-pass welds connecting gussets to the legs are being done with low-hydrogen electrodes which have powdered iron in their flux coating.

End flanges and all other multiple-pass welds are given an initial pass with this same low-hydrogen electrode. An E6024 electrode is then used for subsequent passes until the weld is brought to specified fillet size.

The largest tower leg is a round, solid steel rod 8¾ in. in diameter and 30 ft long, with a weight of 204.5 lb per foot.

The tower will be clearly marked for daytime visibility with alternate 30-ft bands of orange and white paint. At night, three 1,000-watt flashing beacons and nine obstruction lights will illuminate the tower.

A ladder will extend the full height of the tower with walkways at each light level for service and maintenance. Two outside platforms, 4 ft wide, will ring the structure at the 140 and 267-ft levels. They will be used to mount remote pickup discs.

Total weight of the giant structure will run around 478,000 lb. The television station plans to be on the air with its new and more powerful coverage by September 11.

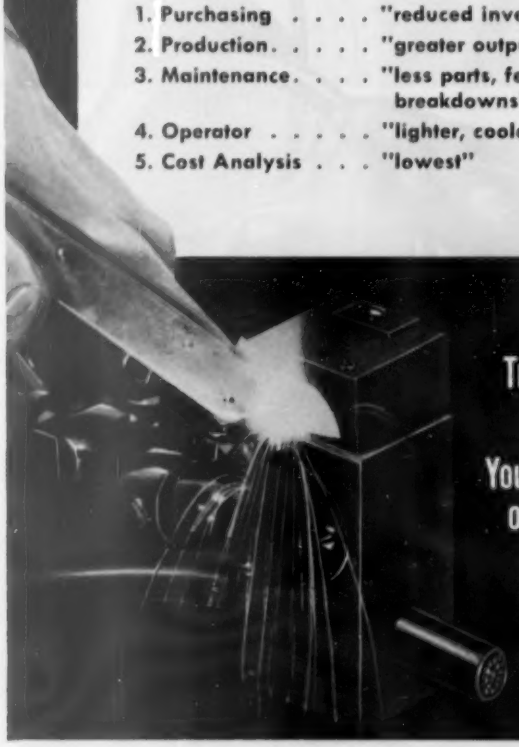
HAS YOUR PLANT TRIED

CADDY?

CADDY Arc Welding Accessories are all designed to utilize the finest of all electrical connections—CADWELD. From welding machine to electrode, the CADWELD connection has revolutionized the arc welding circuit. Today after five years of on the job analysis, companies all over the United States are standardizing on CADDY Arc Welding Accessories and CADWELD cable splicing.

The reason for the acceptance of the complete CADDY Arc Welding Circuit is that it proves itself to:

1. **Purchasing . . . . "reduced inventory"**
2. **Production. . . . . "greater output"**
3. **Maintenance. . . . "less parts, fewer breakdowns"**
4. **Operator . . . . . "lighter, cooler"**
5. **Cost Analysis . . . "lowest"**



Try **CADDY** TODAY—
You'll standardize on **CADDY** tomorrow

CADDY® **Arc Welding Accessory Div.**

Erico Products, Inc.

2070 E. 61st Place • Cleveland 3, Ohio

IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

Eye Protection

Not just a "Welder's Goggle"...

but an AO† Engineered Goggle with Removable & Adjustable Leather Side Shields

Yes, there's a *difference* when you select an eye protection product made by America's leading maker. This 3081A goggle has binder-type leather side shields that are replaceable and adjustable. By loosening endpiece screw, side shields can be adjusted for *perfect fit* and *comfort*. By removing endpiece screws, side shields can be removed for cleaning, sterilizing or replacing. Your nearest AO Safety Products Representative can supply you with this *quality* goggle . . . ask him for it.

QUICK FACTS

- **SIDE SHIELDS** of soft leather for comfort protect against lateral exposures to heat, harmful light, flying particles.
- **CYLINDER BRIDGE** and reinforcing bar covered with leather. Three bridge sizes.
- **TEMPLES** are on-center. Easily adjusted, perspiration-proof, insulated. Temples and endpiece screws are AO "Evertite" construction.
- **ENDPIECES** are streamlined. Wide bearing surface minimizes temple drop. Non-sagging, countersunk screw heads.
- **LENSES** are Super Armorplate clear or Calobar.

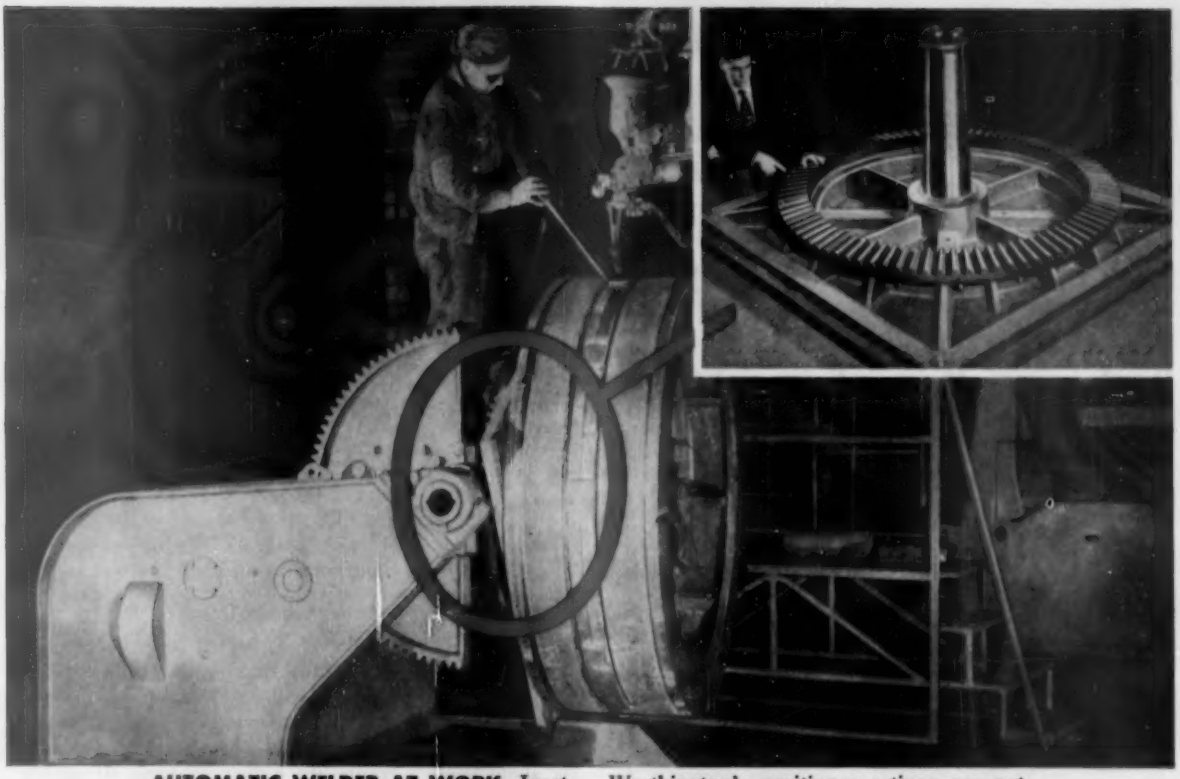
† U. S. REG. BY AMERICAN OPTICAL COMPANY

American Optical

SAFETY PRODUCTS DIVISION

Quality protection is the *only* protection — look for the AO trademark.

SOUTHBRIDGE, MASS. • BRANCHES IN PRINCIPAL CITIES



AUTOMATIC WELDER AT WORK. Inset shows extra-large spindle and rugged bull gear of Worthington Welding Positioner, rated at 24,000 pounds, continuous duty. Worthington's positioner ratings are not just a by-product of the design. Rather, they are the result of extensive tests in laboratory and field.

Double-check welding positioner ratings!

— *don't underestimate their importance*

FREE New Bulletin R-1700-B15 shows you how to choose a positioner. It answers the seven basic questions you should ask before you buy *any* positioning equipment.

In positioners, as in all Worthington products, ratings result from extensive tests in the laboratory and on the job.

Here are two steps that we take to assure you that every Worthington positioner rating is a *job* rating:

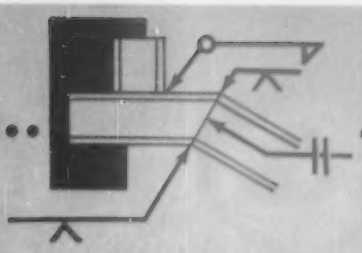
1. Each model is proved on the job before marketing as a standard unit.
2. Each positioner part, including motors, gears, and bearings, is selected to give you extra capacity for overload conditions.

Extra capacity, honestly rated, is typical of *all* Worthington Positioners — from smallest to largest, rated up to 50 tons.

No matter what your size requirements, there's a Worthington Welding Positioner for your job. Like all other Worthington products, its rating is backed by the integrity and reputation of 114 years of engineering experience. That's why you can rate our ratings as "conservative." Write for new Bulletin. Worthington Corporation, Harrison, New Jersey. Y59

WORTHINGTON

Welding Positioners • Turning Rolls



the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Basic metallurgy for weldors

Question:

What is meant by the "space-lattice structure" of a metal?

Answer:

All metals and alloys are composed of grains, or crystals, which may have almost any external shape. However, grains of a particular metal are always similar in angular pattern to each other.

This is because the internal atomic structure of each grain is bound together in a definite pattern, called the space-lattice.

The space-lattice arrangement of atoms determines the shape of the crystalline structure. Atoms in a grain are spaced a definite distance from each other and cannot change this spacing.

Because of this, metallurgists have pictured atoms as being held together by imaginary lines. This is not true, of course, but it is helpful to picture a grain of metal as a three-dimensional lattice-work of atoms held together by imaginary lines.

14 Combinations

There are 14 possible space-lattice combinations. However, so far as users of welding are concerned, it is only necessary to know about three types. These are the: body-centered cubic (Fig. 1), face-centered cubic (Fig. 2) and a close-packed octahedron (Fig. 3).

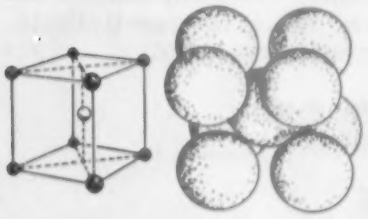


FIG. 1: Atomic structure of a body-centered cubic

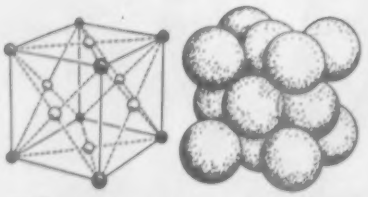


FIG. 2: Face-centered cubic lattice structure has 14 atoms

Most metals crystallize into one of these three forms. Some metals (iron is one) may have two space-lattice structures.

The body-centered cubic lattice is made up of nine atoms—one in each corner of the cube, and one in the center of the cube. A face-centered cubic lattice structure has 14 atoms—one in each corner of the cube and one in the center of each of the cube's six faces. The octahedron (similar to a hexagonal bar) contains 17 atoms.

A body-centered cubic structure is generally assumed by iron, chromium, columbium, molybdenum, tungsten and vanadium. The face-centered cubic grouping is characteristic of aluminum, copper, gold, lead, nickel, platinum and silver. Among the metals having an octahedron (or close-packed hexagonal) form are cadmium, cobalt, magnesium, titanium and zinc.

An iron alloy (steel) has been found capable of assuming two space-lattice structures. In an 0.83% carbon steel, atoms are arranged in a body-centered cubic form at temperatures below 1,333 F. Above that temperature (1,333 F is known as the critical temperature), the atoms assume a face-centered cubic form. Some high alloys have a face-centered cubic form at all temperatures.

Same Volume, Density

A strange part of this change in space-lattice structure, while the metal is in the solid state, is that there is no change in volume or density.

Metals with body-centered cubic grains are higher in yield strength and lower in cold working properties than metals with a face-centered cubic pattern.

An 0.83% C steel at a temperature below 1,333 F has a grain structure called pearlite, composed of alternate layers of soft, ductile, pure iron and hard, brittle iron carbide. All carbon present is in the form of iron carbide, unless other elements are present. Then there may be carbides of these elements as well.

Above 1,333 F, pearlite grains change from a body-centered cubic (nine atoms) atomic arrangement to a face-centered (14 atoms) cubic structure to form austenitic grains. In this change, the iron carbide separates into iron and carbon. The carbon then goes into solution in the iron and becomes evenly distributed throughout the alloy.

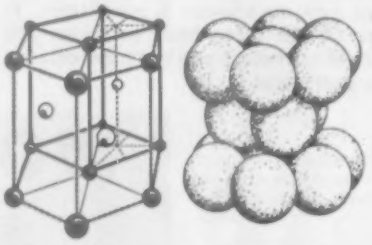
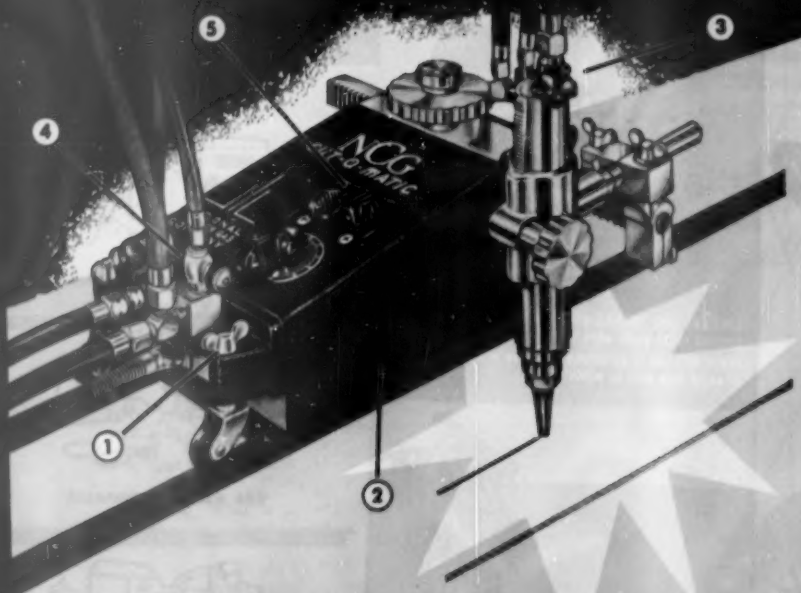


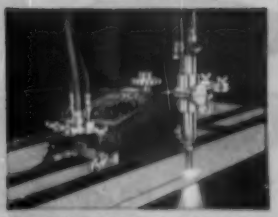
FIG. 3: A close-packed octahedron resembles hexagonal bar

More Accurate, Lighter Weight

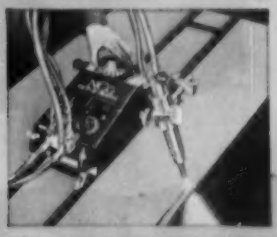
NEW CUT-O-MATIC® NO. 7

PORTABLE FLAME-CUTTING MACHINE

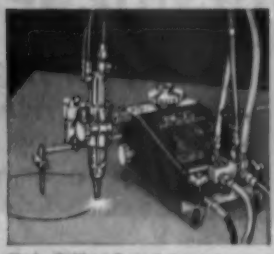




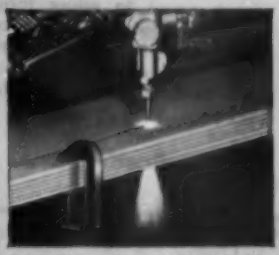
Straight Line Cutting—A 5-foot section of rigid track is supplied with each machine. By using two lengths progressively, a straight cut of unlimited length can be made in one continuous operation.



Bevel Cutting—Straight or circle cuts can be made to any bevel angle by a simple adjustment of the Cut-O-Matic torch holder.



Circle Cutting—True circles and arcs, 3 inches to 80 inches in diameter with either square or bevel edges, are cut easily by attaching the radius rod assembly furnished with each machine.



Stack Cutting—Where many pieces of the same dimensions are needed, stack-cutting with the Cut-O-Matic No. 7 provides real production line economies. Simply clamp plates as shown and use larger size cutting tip.

1 New torch stabilizing device brings new cutting accuracy—A new, unique *floating rear caster* assembly practically eliminates machine wobble and side tilt, when passing over rough, unevenly surfaced plate. Gives production-line accuracy, clean, smooth edges, no finishing.

2 New design cuts 20 lbs. off weight—Almost unbelievably, this new improved CUT-O-MATIC now weighs less than 30 lbs., for ready portability, greater ease of handling—yet it's more rugged than you'll ever need.

3 New 3-hose torch now spells improved cutting efficiency—The new CUT-O-MATIC 3-hose torch has individual oxygen hose to both preheat and cutting orifice, simplifying preheat oxygen adjustment and assuring more efficient cuts.

4 New simplified Gas control—A new valve block assembly now locates preheat controls on machine, separated from high pressure oxygen control on the torch. Adjustments on preheat now made freely without disturbance to oxygen control.

5 New switch is maintenance-free for life of machine—New rotary-type switch, exclusive with NCG, provides trouble-free starting, stopping and reversing for life of machine. Has silver electrical contacts, is permanently sealed against grit and dirt.

CUT-O-MATIC has been redesigned throughout, offers many more advantages than those mentioned here. No other portable flame-cutting machine like CUT-O-MATIC. Get proof, the full story. Ask for a demonstration or write for new big broadside from any authorized NCG dealer or nearest NCG office or address below.

NCG®
EVERYTHING FOR WELDING

NATIONAL CYLINDER GAS COMPANY
840 N. MICHIGAN AVE., CHICAGO 11, ILL.
Branches and Dealers from Coast to Coast

Copyright 1955, National Cylinder Gas Company

NOW... you can do 101 cutting jobs.

EASIER...FASTER...WITH LESS LABOR

AMAZING!

NEW!

BURDOX Beaver

Portable Cutting Machine

MOST POWERFUL...MOST EFFICIENT CUTTING MACHINE IN ITS SIZE CUTS UP TO 4" WITH EASE

STRAIGHT LINE CUTTING using angle iron to support grooved roller guide wheels.

BEVEL CUTTING is performed as above with torch set at angle from plus or minus 45°

CIRCLE CUTTING using radius rod with adjustable compass point centering on any radius from 13 16" to 22".

SHAPE CUTTING by manually guiding the machine along any desired shape

THE BURDOX BEAVER is portable, lightweight, versatile cutting machine. It is, in fact, a POWERED TORCH with performance equal to many larger, stationary types, though retaining many of the advantages of a manual cutting torch. Its unusual features and trouble-free operation make it an ideal unit for both special jobs and production runs.

The entire machine weighs only 16 pounds, making it easy to handle while reducing the possibility of operator fatigue. Almost anyone can operate the BURDOX BEAVER because of its simplicity. It will cut in a straight line or bevel, cut circles and shapes with equal ease. The cutting range is from ⅛" to 4". Power is by means of a 110 volt, 60 cycle motor.

Every Product . . . every Process to fit every Purpose best!

Please send information on Beaver Cutting Machine

NAME_____

FIRM_____

ADDRESS_____

CITY_____ ZONE___ STATE_____

MAIL COUPON TODAY!

THE BURDETT OXYGEN CO.
3302 LAKESIDE AVENUE
CLEVELAND 14, OHIO

PLANTS: Cleveland, Dayton, Youngstown, Ohio & Los Angeles, California

BRANCHES: Akron, Cincinnati, Columbus, Mansfield, Ohio

if it's for WELDING or CUTTING WE HAVE IT

ARC WELDING EQUIPMENT

GAS WELDING EQUIPMENT

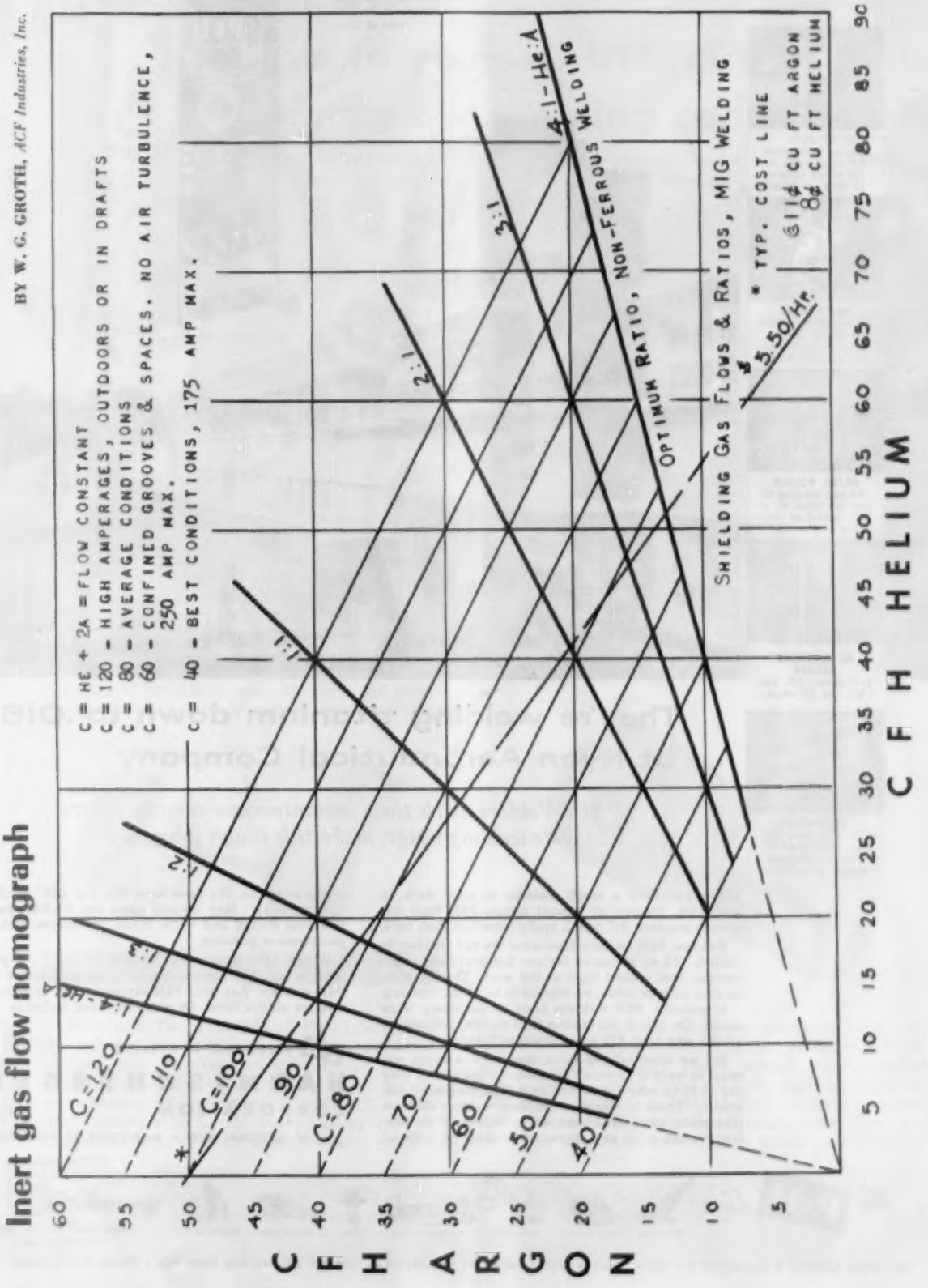
SPOT WELDING EQUIPMENT

SAFETY EQUIPMENT

ACCESSORIES

Inert gas flow nomograph

BY W. G. GROTH, *ACF Industries, Inc.*


C = HE + 2A = FLOW CONSTANT
C = 120 - HIGH AMPERAGES, OUTDOORS OR IN DRAFTS
C = 80 - AVERAGE CONDITIONS
C = 60 - CONFINED GROOVES & SPACES. NO AIR TURBULENCE, 250 AMP MAX.
C = 40 - BEST CONDITIONS, 175 AMP MAX.
SHIELDING GAS FLOWS & RATIOS, MIG WELDING
* TYP. COST LINE
$.50/Hr.
11¢ CU FT ARGON
8¢ CU FT HELIUM
OPTIMUM RATIO, NON-FERROUS WELDING
1:1
2:1
3:1
4:1-He:A
C=120
C=100
C=80
C=60
C=50
C=40
110
90
70
60
50
40
C F H ARGON
C F H HELIUM
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
60 55 50 45 40 35 30 25 20 15 10 5

America's most complete line of arc-welding equipment and electrodes.

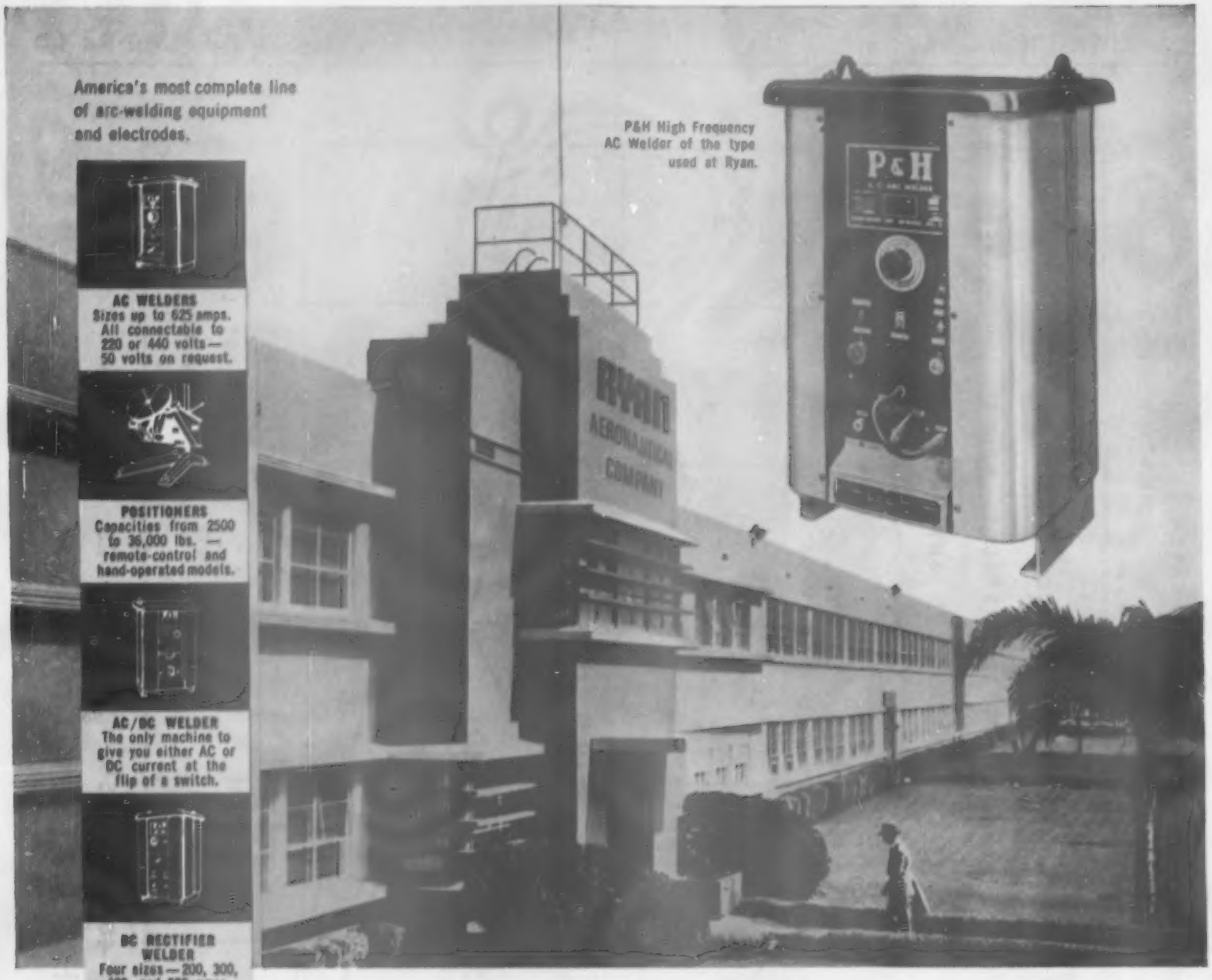
AC WELDERS
Sizes up to 625 amps. All connectable to 220 or 440 volts—50 volts on request.

POSITIONERS
Capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models.

AC/DC WELDER
The only machine to give you either AC or DC current at the flip of a switch.

DC RECTIFIER WELDER
Four sizes—200, 300, 400, and 500 amps.

ELECTRODES
For mild steel, cast iron, "hard-to-weld" steels, stainless steels, hard surfacing.



P&H High Frequency AC Welder of the type used at Ryan.

They're welding titanium down to .016" at Ryan Aeronautical Company

P&H Welders, with their instantaneous remote control and wide welding range, make this tough job easier

When you have a tough material to weld such as aluminum, titanium or special alloys, P&H high frequency welders, AC or DC, really come into their own.

You see, P&H welders have what we call Dial-lectric control. It's an exclusive feature that provides instantaneous heat control right at the work. There are no moving coils or cores, no wheels to turn—no time lag.

In addition, P&H welders have an extremely wide range. On one of our models for example, you can go all the way from 475 amps down to 2 amps.

But we were talking about titanium—a tough material to weld in anyone's language. Here's what they say at Ryan where they use P&H high frequency machines, "There is less of a problem welding titanium than many users have been led to believe. With titanium we can go to any degree of thinness on material so far available. We have been down to .016" on this vital material." May we add again that it's P&H positive heat control and wider range that makes such a performance possible.

If you have tough welding jobs to do . . . if you wish to boost production and cut costs, standardize on P&H welders. Ask your P&H representative or distributor for all the facts. Or write for latest bulletins.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4513 W. NATIONAL AVE. • MILWAUKEE 46, WISCONSIN

the P&H Line

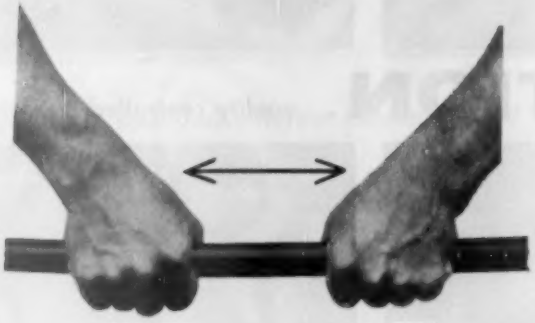
2981

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING COMPANY LTD., 455 King Street West • Toronto, Ontario, Canada

TRY THESE TESTS

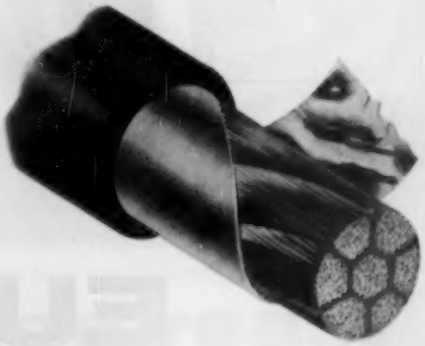
. . . prove to yourself UNIFLEX outlasts ordinary arc welding cable 2 to 1!

NOTE: *UNIFLEX has long been your guarantee of highest quality in resistance welding cable. Now, the same high UNIFLEX quality is also available in UNIFLEX arc welding cable.*



1 Take a 12" length of UNIFLEX and cut the rubber jacket around the middle, down to the conductor. Grasp both ends and try to pull the jacket from the conductor. Feel the resistance. That's the special UNIFLEX wrapping of aluminum foil, backed by tough kraft paper, which separates conductor and rubber jacket. High friction of aluminum against copper winding stops jacket from slipping over conductor. That's why the all-important end sections of UNIFLEX conductor stay covered and protected to eliminate shorting and burning.

2 Now take a length of UNIFLEX and *bend it back and forth several times.* Feel how easily it flexes. That's because the thousands of finely drawn copper conductors inside are specially wound and grouped so they slide smoothly over each other. Strain of bending is distributed equally throughout the strands. This reduced stress on individual strands is another reason for UNIFLEX's extra long cable life.



3 Beat it up! Tie it in knots! Put UNIFLEX through the most rigorous tests you can think of. See how "continuous vulcanized" rubber jacket (made like an automobile tire) stands up under rough treatment. UNIFLEX resists heat, moisture, oil, and aging, as proved by tests equivalent to more than 10 years service.

4 Let UNIFLEX prove its worth in your own shop. Keep a record of costs . . . see how UNIFLEX actually saves money over so-called "price" cable. You not only save on cable replacement costs, but cut down on work interruptions as well. Welders do better work, don't tire as fast, with easy-flexing UNIFLEX. Try it!

GAR WOOD GW INDUSTRIES

For the name of the UNIFLEX distributor nearest you, just enclose this ad with your letterhead and send to address at right.

UNIFLEX CABLE DIVISION
United Metal Craft Company
800 Lowell St., Ypsilanti, Michigan
DIVISION OF GAR WOOD INDUSTRIES, INC.

Everyone "claims" service today...we "mean"

RESEARCH ...creating an ever-growing list of

PRODUCTION ...quality controlled, versatile, to

SERVICE ...more than 350 District Engineers

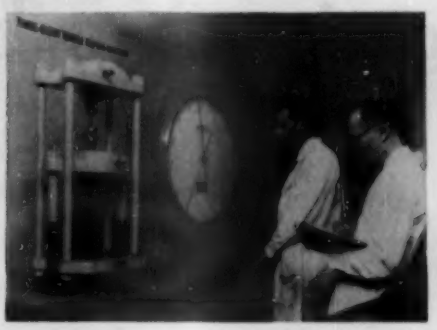
EUTECTIC ...

Your Eutectic District Engineer has the new Eutectic picture book of facts — ask him for a copy of this helpful volume — it's packed with stories and photographs of independent tests showing actual proof of "Eutectic" savings.

Here is the perfect combination of "welding alloy exclusively" research, production, and service, in which teams of metallurgists, chemists, and engineers create new and better welding materials . . . in the versatile production lines . . . to the Eutectic District Engineers all over the country who bring into your shop the advantages of the famous "Low Heat Input" metal joining process which minimizes or eliminates distortion, stress and embrittlement. Here, indeed, are the reasons why Eutectic "Low Temperature Welding Alloys" are preferred

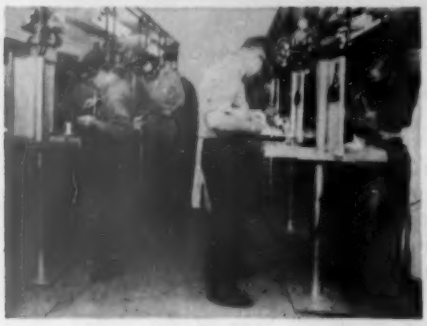
service whether you use 5 lbs. or 5,000 lbs. of alloy!

"Low Temperature Welding Alloys"® which minimize distortion, warping and embrittlement



produce more than 160 different job-engineered "Low Temp" EutecRods and "Low Amp" EutecTrodes.

going into shops everywhere to bring you all the benefits of Eutectic research and know-how.



® A REGISTERED TRADE MARK OF EUTECTIC WELDING ALLOYS CORPORATION

preferred for good reasons

and specified by more than 87,000 users for all their metal joining needs. These weldors and engineers know that Eutectic is "America's leading institution devoted to the research and manufacture of special metal joining alloys" — your guarantee of "Better, Faster, Cheaper" welding.

FREE . . . to help you select from among the more than 160 EutecRods and EutecTrodes, those that will give you the largest savings per job, write for your free copy of our 32-page DirectoRod Guide. Ask for TIS 1340

BOOTH No. 1225
37th Annual
National Metal Exposition and Congress
Philadelphia Convention Hall
October 17th through October 21st

EUTECTIC WELDING ALLOYS CORP.

40-40 172nd Street, Flushing 58, New York

WORLD-WIDE WELDGINEERING TEAM
With Associated Laboratories in

Lausanne, Switzerland
London, England

Low Temperature EUTECTIC WELDING ALLOYS

Paris, France
Frankfort, Germany

A new, semiautomatic process allows . . .

Big savings in silver brazing

BY JOHN B. HILL, JR.*

AN EXAMPLE of technical ingenuity in the face of authoritative skepticism has been performed by engineers of Sawyer Bailey Corp., Buffalo, N. Y.

This company, which designs and manufactures high-speed compressors and centrifugal products, developed a semiautomatic silver brazing process for rotors and stators for fan assemblies used to air-cool ordnance engines.

Working closely with Strate Welding Supply Co., Inc., of Buffalo, the engineers planned a production method that resulted in overall savings of 60% in man-hours and 68% in silver alloy brazing material.

The success of this production job is based on newly-designed jigging assemblies, the gravity-feeding of powdered silver brazing alloy, and the wetting action of a flux. Also important are blade clips which support each blade firmly against the contoured hub through a single pressure point, nozzle location for heating, and tilt angle applied to the assembly.

Lack of uniformity in manually brazed joints was the basic problem to be overcome. Even with a semiautomatic set-up, some retouching had to be done until Sawyer Bailey began applying flux.

Previous attempts had been unsuccessful in maintaining wetting action necessary to carry the flow of brazing material consistently to the forward end of the rotor blade. The ability of flux to maintain proper wetting action *throughout the heat cycle* solved this knotty problem and reduced "touching up" operations to a minimum.

The rotors are silver-brazed at Sawyer's Buffalo plant, while the stators are made at the Warsaw, N. Y., plant. Final assembly of the two units for the airfan is done in Buffalo.

**Chief Engineer, Sawyer Bailey Corp., Buffalo, N. Y.*

FLUX brushed on rotor hub stays wet through heat cycle and carries brazing material to all vital areas

Gravity Feed

In the production of rotors, powdered silver alloy is applied by gravity feed from a hopper through a tube onto the hub. The 40-mesh silver powder clings to the fluxed hub, and is fed through the tube at a rate that produces the right coat after two revolutions of the assembly.

It drops through the flux and flows into joints as it heats, making uniform joints of high strength and good appearance.

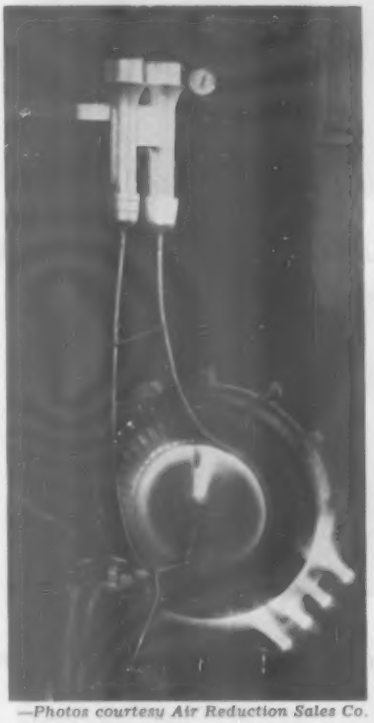
The stator includes a set of blades similar to the rotor, but with the addition of boundary-plates attached to leading edges of the blades. Because the outer ring holds the blades firmly, clips are not required as they are for the rotor jig.

A base plate with locating pins is loaded with a hub, then the blades. The outer ring is set in place and arc welded with E-6012 electrodes. The assembly is tilted on the welding positioner and brazing is done as with the rotor.

Two torches with heating tips are used to heat braze material fed through the tubes, one for the outer ring, the other inside the stator hub.

Alloy Helped

Use of a powdered silver brazing alloy contributed heavily to the success of this operation. It was used only after considerable experimentation with wire, sheet, and a mixture of powdered brazing material and flux applied with a brush. These approaches, which were found wanting, led finally to the use of a hopper for gravity feeding.



—Photos courtesy Air Reduction Sales Co.

TUBES from hoppers pour powdered-silver alloy on stator as jig turns unit for uniform heating

Particular attention had to be paid to the feed mechanism for the powdered braze material. The rate of feed had to be even and material had to build up to a proper level in just the right amount of time.

Experimentation established the angles on the sides of the hopper 40% from vertical. Inside surfaces had to be polished and the orifice at the bottom of the hopper had to be determined to produce just the flow rate required.

Although automatic equipment is not entailed, Sawyer Bailey also uses their brazing facilities for fabricating light-weight steel nozzle rings and high-speed turbines and exducers for jet aircraft air-turbine starters.

The rotary components operate at speeds in excess of 70,000 rpm. However, one recently designed miniature turbo oil pump, using a brazed impeller, has a terminal speed of approximately 500,000 rpm.

Welding builds it faster, lighter and safer...

and RADIOGRAPHY checks each weld.

It swims. It climbs. It fights. It's tough and strong. For, from stem to stern, this L. V. T. is welded.

Welding saves precious weight and countless man-hours in construction. It avoids the rivets and bolts which become as lethal as shell fragments under shock.

With Radiography checking for soundness, welding continually finds new work to do—solves problems that would make jobs like this L. V. T. virtually impossible.

So weld shops, with small operations or large, are finding radiography valuable both for building reputations for good work and for expanding into new fields. If you would like to explore how Radiography can help you increase your business, get in touch with your x-ray dealer. He'll gladly talk it over.

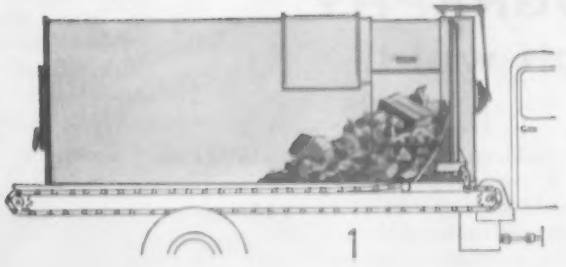
RADIOGRAPHY

...another important example of photography at work

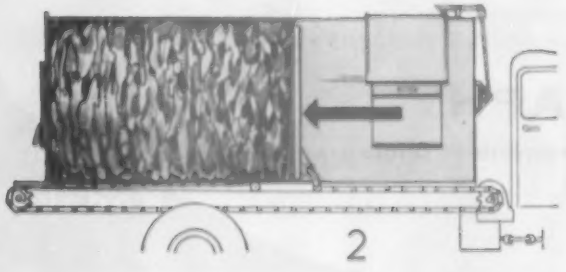
Kodak

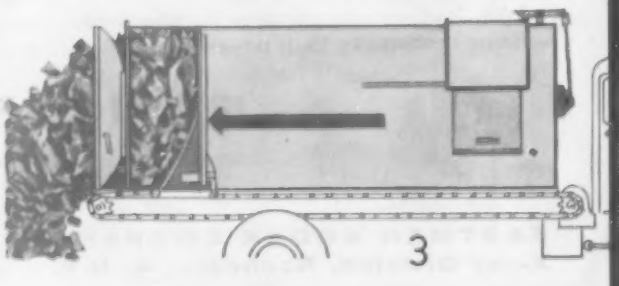
EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N.Y.

Welds withstand 50,000



Here's the Pak-Mor refuse collection unit . . . welded throughout with A. O. Smith SW-85 electrodes. Front panel opens for loading. Packer plate not only compresses the load but also serves to discharge *the complete load* through the rear hatch. At present, Pak-Mor units are being used in 44 states, Washington, D.C., 602 communities across the nation and in these following foreign countries: Alaska, Canada, Colombia, Hawaii, Japan, Mexico, Panama Canal Zone and Venezuela.





lbs. force . . . . all day, every day. . . . without failure

They're made with A. O. Smith SW-85 electrodes . . . serve on ingenious Pak-Mor refuse collection units

A. O. Smith SW-85 electrodes are used *exclusively* in the building of unique all-welded Pak-Mor refuse collection units. Welds must *continuously* withstand a force of 50,000 lbs. exerted by a heavy-duty packer plate which travels the full length of the Pak-Mor body . . . compresses the load towards the rear hatch.

The builders of Pak-Mor selected SW-85 electrodes because of high tensile strength and durability. They are also pleased with easy handling in all positions — vertical, horizontal or flat. What's more, the SW-85 scores high with welders . . . proves its versatility in clean-up as well as production. It's readily adaptable to both a-c and d-c welding.

Get complete details from your A. O. Smith distributor. Or, if you prefer, write direct. A. O. Smith Corporation, Welding Products Division, Milwaukee 1, Wisconsin.

The man from A. O. Smith . . .

Grant Annable introduced Pak-Mor management to the SW-85 electrode. Like all A. O. Smith welding salesmen, Grant is always ready *and able* to help solve welding problems.

Everything for welding is yours from A. O. Smith!

Welding is now *(and always has been)* our full-time business. Our record dates from the pioneering of the first truly practical welding electrode. We offer you America's top line of electrodes . . . welder-proved equipment and accessories . . . everything from a-c and d-c welding machines to helmets and tools.

Through research . . . a better way

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
INTERNATIONAL DIVISION: MILWAUKEE 1, WIS.

on the job

—*Martin Inc.*

TWENTY single-point turning tools, held in slots by set screws, are ground at one time. New tool holder rotates counter to silicon-carbide grinding wheel, giving five times faster service than individual treatment

—*Crane Co.*

UNUSUAL pipe coil assembly for superheating service demonstrates versatility of modern welding and bending techniques. Assembly is fitted with 1-in. and 1½-in. extra-heavy welded half-couplings

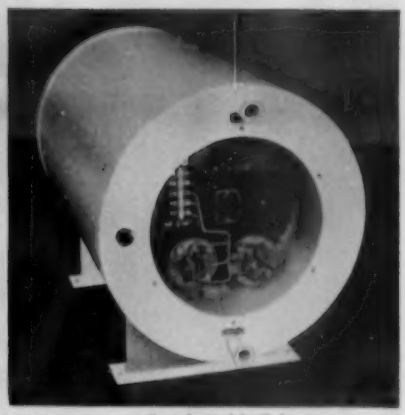
LEFT: Special steel pots, fabricated by welding, have been found capable of holding molten salt up to 1,750 F for the salt bath hardening of tools *(Photo courtesy Ajax Electric Co.)*

—*Metallizing Engineering Co.*

SEVERE operating conditions for pump rods used to clean gritty oil tank bottoms after vaporization of crude oil wore out cold-drawn steel rods in 48 hours. Stainless metallized rods were found to last four weeks, and can be hardfaced with a molybdenum coating three times

—*Linde Air Products Co.*

AUTOMATIC submerged-arc welder joins short pipe sections into 80 and 90-ft lengths. Flange is tack-welded to positioner table



ABOVE: A completed Hubbell booster water heater.

LEFT: Welding the head on a 10-gallon Everdur booster heater tank using Anaconda ⅛" Everdur-1010 Rod. All spuds, flanges and fittings are Everdur.

Everdur tanks...welded with Everdur-1010 rod make long-life booster water heaters

Water at 180F may be highly corrosive. Yet 180-degree rinse water is required by many sanitary codes for sterilization in commercial dishwashing machines.

The Electric Water Heater Co. of Stratford, Conn., makers of Hubbell water heaters, and one of the pioneers in the electric water heater business, builds 10-gallon and 20-gallon models for just this service. Experts in the design and fabrication of water heating equipment, Electric Water Heater Company is also a pioneer in the use of Everdur* for its tanks.

The tinned Everdur tanks for booster heaters are welded by the carbon-arc method, using Everdur-1010 Welding Rod. In this tough service in restaurants, hotels, schools and institutions, the tanks have performed dependably and are considered to have a long life expectancy.

AnacondA Welding Rods for many types of welding are available from distributors throughout the United States and Canada. See your distributor for help in selecting the exact rod to help you speed assembly and cut production costs. Or write for Publication B-13. Address The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

*Reg. U. S. Pat. Off. 55135

braze or weld with confidence

ANACONDA®

welding rods

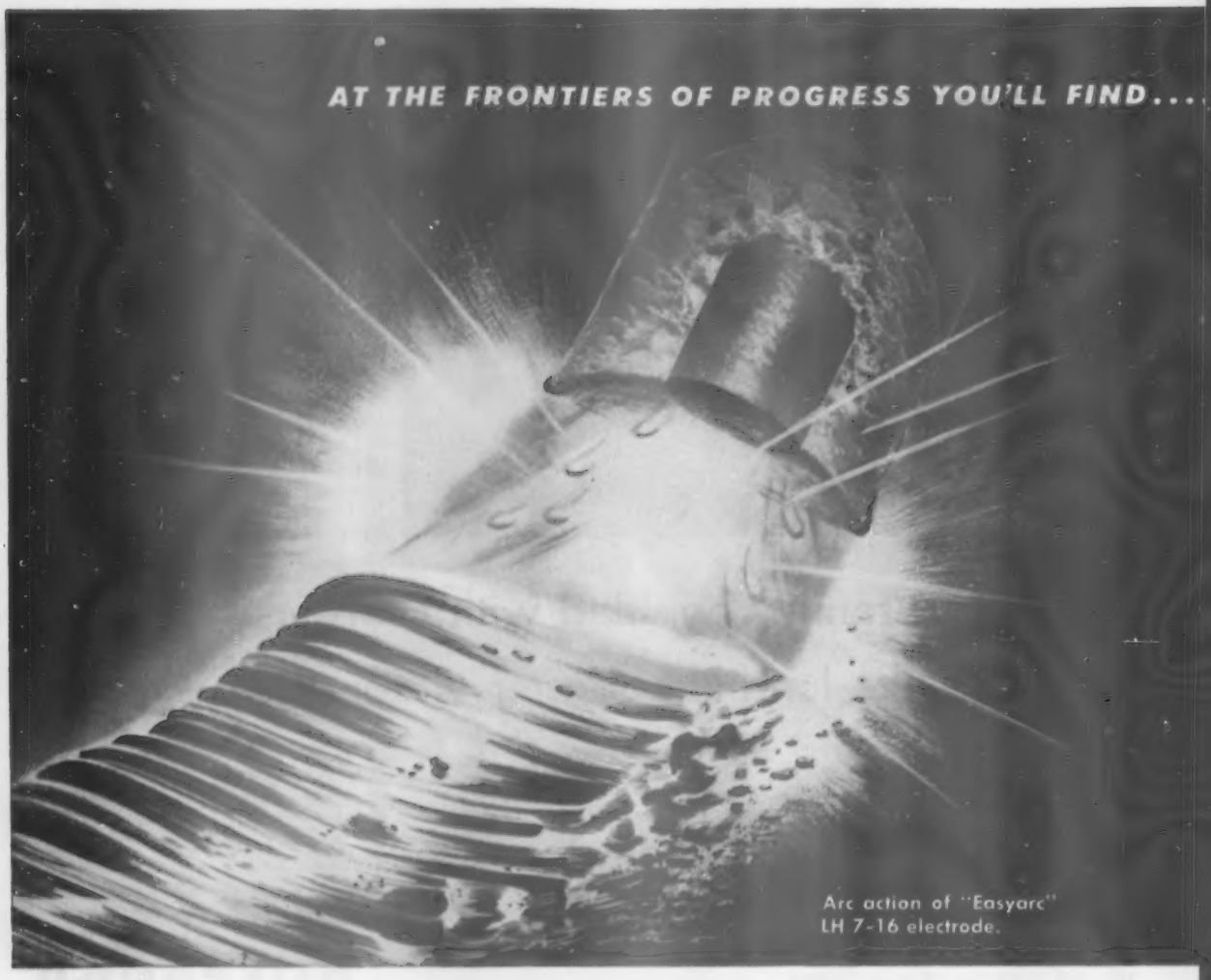
You can select from

9

ANACONDA welding rods

NAME OF WELDING ROD	APPROX. MELTING POINT, DEGREES Cent.	Fahr.	USUAL APPLICATIONS
*ANACONDA COPPER-372 (Patent No. 2,220,464)	1075	1967	Inert-gas arc and oxyacetylene welding of copper.
TOBIN BRONZE-481	885	1625	Oxyacetylene braze welding of steel, cast iron, and copper alloys.
ANACONDA-997 (Low-Fuming) BRONZE	870	1598	A low-fuming manganese bronze for use where the highest weld metal properties are required. Oxyacetylene braze welding of steel, cast iron, and copper alloys, and for bearing surfaces.
NICKEL SILVER-828	930	1706	Oxyacetylene braze welding of cast iron and steel for strong, color-matching welds and bearing surfaces.
CUPRO NICKEL-826 (Patent No. 2,012,450)	1225	2237	Oxyacetylene welding of Cupro Nickel and surfacing of steel.
*EVERDUR-1010	1019	1866	Inert-gas arc, carbon-arc and oxyacetylene welding of Everdur, copper and copper alloys. Also for welding to, and for surfacing steel.
*PHOSPHOR BRONZE-351	1050	1922	Inert-gas and carbon-arc welding of phosphor bronze and copper, and for surfacing steel.
*PHOSPHOR BRONZE-354	1000	1832	Inert-gas and carbon-arc surfacing of steel, and for welding phosphor bronze.
**AMBRALOY-928	1040	1904	Inert-gas consumable-electrode welding of aluminum bronze and for surfacing steel.

*These alloys are also used in the inert-gas consumable-electrode process. Spooled rods are marketed by the manufacturers of the welding equipment.
**Supplied only on spools by the manufacturers of the welding equipment.



New "Easyarc" LH 7-16 deposits 60% more metal!

In comparative tests the new EASYARC LH 7-16 electrode deposited 6.58 pounds of metal per hour! This is actually 61.3% more metal than conventional low hydrogen electrodes of the same diameter.

Here's how the new EASYARC LH 7-16 does it:

(1) The concave end of the electrode concentrates the arc energy.

(2) Powdered iron coating melts and becomes an integral part of the weld.

(3) The extra-heavy coating helps control arc action and allows higher currents to be used in complete safety.

In addition to speed, the new EASYARC LH 7-16 produces outstanding results with hard-to-weld steels where highest quality is essential. Welds prove to have superior stretch and toughness characteristics. There's no underbead cracking. It's safe, too! The thick powdered metal coating is designed to eliminate the possibility of accidental arcing.

Let the new EASYARC LH 7-16 prove itself. Send for a *free* sample electrode today. Contact your nearest Airco office, Authorized Airco Dealer or write to Airco at the address below.

AIRCO®

AIR REDUCTION

60 East 42nd Street • New York 17, N. Y.

Divisions of Air Reduction Company, Incorporated, with offices and dealers in most principal cities

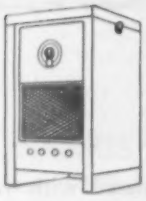
Air Reduction Sales Company
Air Reduction Pacific Company
Represented internationally by Airco Company International
Foreign Subsidiaries:
Air Reduction Canada Limited
Cuban Air Products Corporation

Products of the divisions of Air Reduction Company, Incorporated, include: AIRCO — industrial gases, welding and cutting equipment, and acetylenic chemicals • PURECO — carbon dioxide, liquid-solid ("DRY-ICE") • OHIO — medical gases and hospital equipment • NATIONAL CARBIDE — pipeline acetylene and calcium carbide • COLTON — polyvinyl-acetates,—alcohols, and other synthetic resins.

AN AIR REDUCTION PRODUCT

AIRCO items for arc welding

AIRCO HOLDERS—Famous Jackson jaw-type and Martin Wells screw-type holders. Nineteen Jackson Models from 200 to 500 amperes. Six Martin Wells, including the Heavy Duty Model 6S—the only holder on the market that will handle 700 amperes.



NEW AIRCO DC "BUMBLEBEE" rectifier type arc welders in 200, 300, 400 and 600 ampere models. The newest member of a famous arc welding family. Also available in twin model. Outstanding features include:

- No moving parts except fan.
- 3-step current selector switch with rheostat.
- Handy remote control outlet.
- Twin channel cooling system.
- Concealed electrode and work terminals.

AIRCO HELMETS—a complete line of helmets and face shields in a wide variety of styles and types. In any kind of service these Airco products provide the greatest possible operator safety and comfort.

Write for literature on these items.

—Photo courtesy Haynes Stellite Co.

MACHINE hardfaces 1,000 grinder hammers per day with marked savings in gas and cast-tungsten carbide over manual method

400% more life added to grinding hammers

AN INCREASE of 400% has been reported in the life of hammers in a heavy-duty grinder. This remarkable saving was brought about through a hardfacing process using cast-tungsten carbide tube rods.

The grinders housing these hammers are used to pulverize abrasive materials: metal turnings, limestone, mica and glass. They also pulverize such diverse materials as alfalfa, chemicals, meat scraps and paper pulp.

Hammers rotate at speeds from 3,000 to 3,600 rpm. Material fed into the grinding chamber is picked up by the rapidly moving hammers and thrown against a baffle. This process continues until the material is fine enough to pass through a perforated plate.

A cast-tungsten carbide tube rod is the standard hardfacing material for hammers handling all the material described above. In addition to increasing life of the hammers, the process also keeps the cylinder in balance longer.

Hardfacing is done mechanically at the W. W. Grinder Corp. of Wichita, Kan., manufacturer of the grinding machine. About 1,000 hammers per day are hardfaced using Model 800 straight-line hardfacing machine.

Four 6-ft lengths of 20 on 30 mesh No. 60 cast-tungsten carbide tube rod are used in the machine to cover the area to be hardfaced. Seventy of the special steel hammers, bolted together, are processed at a time. Afterward, they are heat-treated, then snapped apart quite easily.

The machine travels at a rate of about 5 in. per minute, laying a 3/16-in.-thick deposit of tungsten carbide on the hammers. No facing is applied to the sides of the hammers.

The manufacturer has found that elimination of hardfacing on the sides produces a slight undercut during operation. This procedure increases the efficiency of the hammers, and as a result they can be used until only a tiny button of tungsten carbide remains.

PULVERIZING everything from alfalfa to metal turnings, grinder gives its 36 hammers rough usage

Welder is shown welding a "wear-sharp" repointer to the shank of a dipper tooth using the Amsco MF and flux.

HARDFACE WITH THE AMSCO® MF

for manual flexibility . . . plus machine speed and accuracy

The Amsco MF combines the visibility and craftsmanship of hand welding with the automatic advantages of machine work. Speed of hardfacing increases because the Amsco MF uses small-diameter electrode and high-current densities which allow the operator to maintain a high deposit rate. The electrode feed is continuous—and automatically regulated—to maintain a constant arc. Thus, the machine automatically *compensates* for operator movement or an irregular welding surface.

Cost of deposited metal is less! The Amsco MF uses coiled, bare mild steel electrode. It feeds through the flux hopper (the cone). There it is magnetically coated with your choice of manganese steel build-up or hardfacing alloy which is carried in the flux. You coat your electrode as you weld at considerable savings in deposit cost.

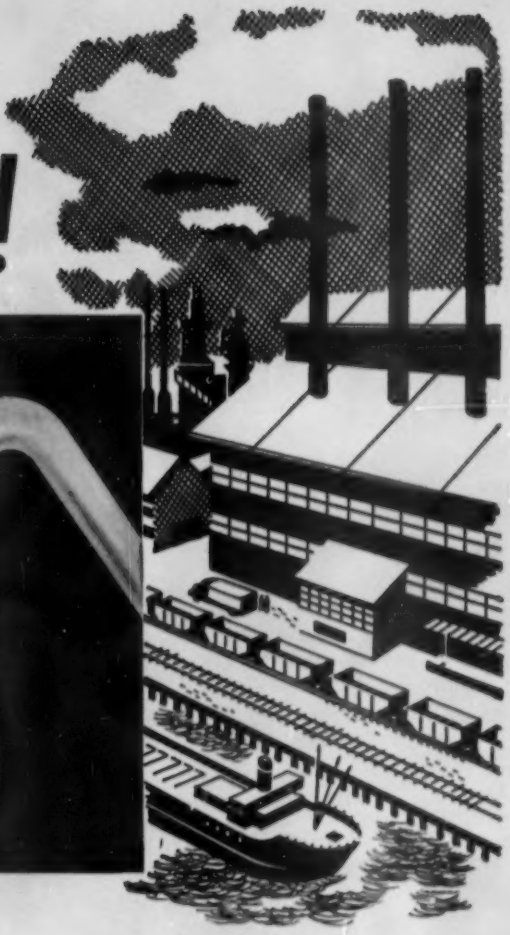
The machine is portable. It plugs into any standard welding unit, and requires no special setup. See a demonstration of the Amsco MF's speed, quality of weld and uniform deposit. Try it yourself and discover how easy it is to operate. Your Amsco Distributor is ready to show it to you now. Welding products are distributed in Canada by Canadian Liquid Air, Ltd.

make your Amsco Distributor HARDFACING HEADQUARTERS

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

TERRIFIC HEAT !

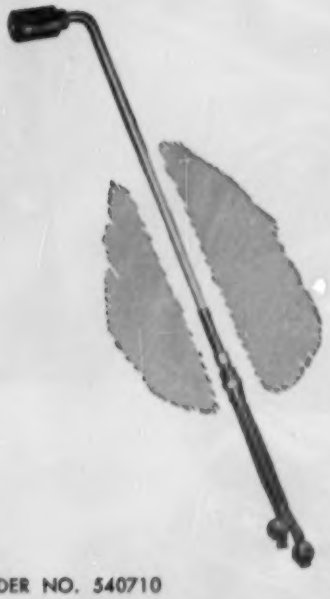


HARRIS SUPER-HEAT TORCH NO. K23

Heat is the Prime Factor utilized in connection with innumerable Metal Working Operations. While it is a fact that the Oxy-Acetylene Welding Torch is universal in its applications, there are many Operations requiring a much greater volume of Intense Heat than can be obtained from a Welding Torch.

A definite limitation exists relative to the amount of Oxygen and Acetylene Gases which can be safely mixed without danger of the Flame "Back-firing", due to the extremely fast Flame Propagation Characteristics of such Gas Mixtures. On the other hand, much larger volumes of such Fuel Gases as Propane, City Gas and Natural Gases can be safely mixed with Oxygen on account of their lower rate of Flame Propagation. It is evident the larger the volume of Gases mixed, the greater the Flame and resulting Heating Value. This produces the truly phenomenal results achieved by this Harris Super-Heating Torch.

The applications of this Harris Torch are unlimited, where large volumes of Intense Heat are required, either as a Portable or Stationary Unit. In places where Massive Shafts are to be Straightened; Large Size Pipe Bent; Flanging or Straightening of Steel Plates; Brazing Heavy Copper Pipe, etc., etc., this Harris Torch, with its **TERRIFIC HEAT**, is the answer.



HARRIS 1905 50 1955 ANNIVERSARY

SEND FOR DESCRIPTIVE FOLDER NO. 540710

THE HARRIS CALORIFIC COMPANY
CLEVELAND 2, OHIO

Q. Is it possible to be certain we are using the right filler metal for consumable electrode welding?

A. Yes. Alcoa's new I.G.* Electrode is available in such a wide range of alloys and sizes that there is a right one for every job.

Every production lot of Alcoa* I.G. Electrode is test welded and the welds X-rayed for soundness. Each 10-lb spool is individually packed to maintain the super-smooth finish to assure soundness of weld and smoothness of feed. Each of five alloys, 1100, 4043, 5154, 5254 and 5356 (formerly 2S, 43S, A54S, B54S and XC56S), is available in six diameters. There is no better electrode.

*inert gas

Your guide to aluminum value

I.G. ELECTRODE MADE OF
ALCOA
ALUMINUM
ALUMINUM COMPANY OF AMERICA

A new, 176-page text, *Welding Alcoa Aluminum*, has just been released by Alcoa. It covers every phase of welding in complete detail. For a free copy, fill in and mail the coupon.

ALUMINUM COMPANY OF AMERICA
1740-J Alcoa Bldg., Mellon Square
Pittsburgh 19, Pa.

Gentlemen: Please send book, *Welding Alcoa Aluminum*.

Name_____

Company_____

Title_____

Address_____ City_____ State_____

Q. Where is Alcoa's new I.G. Electrode available?

A. Contact your nearest Alcoa sales office, or, for immediate delivery, call one of the Alcoa Distributors listed below. He carries a complete range of alloys and sizes and you'll find him well qualified to work with your welding experts.

ALABAMA
Birmingham
†Hinkle Supply Co.
CALIFORNIA
Berkeley
Ducommun Metals & Supply Co.
Los Angeles
†Ducommun Metals & Supply Co.
Pacific Metals Company, Ltd.
San Diego
Ducommun Metals & Supply Co.
San Francisco
†Pacific Metals Company, Ltd.
COLORADO
Denver
Marsh Steel Corp.
Metal Goods Corp.
CONNECTICUT
Milford
†Edgcomb Steel of New England, Inc.
FLORIDA
Jacksonville
Florida Metals, Inc.
Miami
Florida Metals, Inc.
Tampa
†Florida Metals, Inc.
GEORGIA
Atlanta
†J. M. Tull Metal & Supply Co., Inc.
IDAHO
Boise
Pacific Metal Co.
ILLINOIS
Chicago
†Central Steel & Wire Company
Corey Steel Co.
†Steel Sales Corp.
INDIANA
Indianapolis
Steel Sales Co. of Indiana, Inc.
KANSAS
Wichita
Marsh Steel Corp.
Metal Goods Corp.
KENTUCKY
Louisville
Williams & Co., Inc.
LOUISIANA
New Orleans
Metal Goods Corp.
MARYLAND
Baltimore
Whitehead Metal Products Co., Inc.
MASSACHUSETTS
Cambridge
Whitehead Metal Products Co., Inc.
MICHIGAN
Detroit
Central Steel & Wire Company
Steel Sales Co. of Michigan
MINNESOTA
Minneapolis
Steel Sales Co. of Minnesota
MISSOURI
Kansas City, North
†Marsh Steel Corp.
Metal Goods Corp.
St. Louis
†Metal Goods Corp.
NEW HAMPSHIRE
Nashua
Edgcomb Steel of New England, Inc.
†Home Office

NEW JERSEY
Harrison
Whitehead Metal Products Co., Inc.
Hillside
Miller Steel Co.
Kenilworth
Kenilworth Steel Co.
NEW YORK
Albany
†Eastern Brass-Mueller-Huntley, Inc.
Buffalo
Brass-Mueller-Huntley, Inc.
Whitehead Metal Products Co., Inc.
New York
(L.I.City) Adam Metal Supply Co., Inc.
Eastern Brass & Copper Co.
Manhattan Brass & Copper Co.
Straits Aluminum Company, Inc.
†Whitehead Metal Products Co., Inc.
Rochester
Brass-Mueller-Huntley, Inc.
Syracuse
†Brass-Mueller-Huntley, Inc.
Whitehead Metal Products Co., Inc.
NORTH CAROLINA
Charlotte
Edgcomb Steel Co.
OHIO
Cincinnati
Central Steel & Wire Co.
Williams & Co., Inc.
Cleveland
†The Hamilton Steel Warehouse
Jones & Laughlin Steel Corp.
Williams & Co., Inc.
Columbus
Williams & Co., Inc.
Toledo
Williams & Co., Inc.
OKLAHOMA
Tulsa
Metal Goods Corp.
OREGON
Portland
†Pacific Metal Co.
PENNSYLVANIA
Philadelphia
†Edgcomb Steel Co.
Whitehead Metal Products Co., Inc.
Pittsburgh
†Williams & Co., Inc.
York
Edgcomb Steel Co.
TENNESSEE
Memphis
Metal Goods Corp.
TEXAS
Dallas
Metal Goods Corp.
Houston
Metal Goods Corp.
UTAH
Salt Lake City
Pacific Metals Company, Ltd.
WASHINGTON
Seattle
Pacific Metal Co.
WISCONSIN
Milwaukee
Central Steel & Wire Company
Steel Sales Co. of Wisconsin

Welded scaffold lets patient resume job

A simple, lightweight tripod enabled this crash victim to leave confining hospital traction.

AUTO crash victim demonstrates vertical traction advantages of portable scaffold

AN UNUSUAL welding project was undertaken recently because of an automobile accident. Sustaining severe back injuries in the crash was Virgil Osborne, Southwest district manager for Farrel-Birmingham Co. The accident shortened his 5 ft 11 in. frame two full inches.

Mr. Osborne's physician prescribed traction devices at the hospital. Weeks passed, and the patient grew restless. Impatient to return to work, yet faced with many more weeks of confinement, Mr. Osborne asked his doctor if there was any way to speed recovery.

The doctor explained that recovery might be accelerated if there were some means of exerting sufficient weight on the neck and spine. This weight, said the doctor, would have to be evenly distributed and steadily applied to stretch the patient's back into it's normal shape.

Supports 200 lb

Mr. Osborne's mechanical background immediately set his mind to conjuring. On Friday evening, he contacted a friend, and together they planned a device to elevate gently and vertically a 200-lb., 6-ft. human. By Sunday afternoon, a rough sketch had been made of a basic tripod design using strong stainless tubes to support the load. In going over the sketch, the two decided to make the device portable, and to build specifically for ease in handling, assembling and disassembling. A traveling man, Mr. Osborne wisely suggested a maximum clearance of 7 ft. for low motel rooms.

On Monday, the designer took the problem to Hahn & Clay of Houston, Texas, where engineers checked strength of design and suggested the "neck stretcher" be made of aluminum bars and tubes to provide a lighter unit. The revised plans were submitted, and approval was given by Mr. Osborne and the doctor on Tuesday.

Frame Successful

Fabrication was started immediately, and by use of Tig (tungsten inert-gas) welding, the scaffold was completed early Wednesday and successfully tested by hanging a 200-lb. man from the center hook. This provided the main frame, but the means for elevating the patient had yet to be solved.

With the doctor's aid, a set of pullies was designed and attached to the apex of the tripod and to a double-hooked horizontal bar. Made to the exact width of the patient's head, the bar in turn supported a conventional canvas head-traction device.

By Thursday, the firm completed the entire unit and Friday, one week after the birth of the idea, Mr. Osborne was hanging vertically for necessary traction. After three days of "practice," he was able to sustain hanging for intervals of several minutes. He left the hospital then—on the road to recovery.

The portable scaffold, carried in a light case, weighs less than 15 lb. Mr. Osborne can now administer proper treatment to his back merely by setting up the tripod and hanging for a prescribed period of time.

Welder in a hole keeps road builder out of one

Saves a contract and over $1,000 *with* Ni-Rod "55"

Above, you see a worm's-eye-view of a 14-ton road grader.

A sheared-off bolt had shattered the heavy cast iron gear case. This threatened a road builder with months of downtime. New parts — when he got them — would cost over $1000. Contract penalties would cost him plenty more while he waited.

Welding was the only alternative. But would it work? There were problems, all right. Oil seepage was one. Another was just getting *at* the job from underneath the grader.

Welding *did* work! It worked because easy-handling NI-ROD "55"® electrodes produced sound, ductile deposits (after one pass with a special mild steel electrode to seal the root of each crack and stop oil seepage).

The welder worked overhead from a five-foot trench. Worked with a "skip" technique to prevent overheating. He used just 10 pounds of NI-ROD "55", 1/8-inch and 3/16-inch diameters.

In 12 hours the road grader was back in service. *The cost: only $20 for materials.*

Now, after nearly two years, the cast iron gear case welded with NI-ROD "55" is still in use . . . proof you get sound, ductile welds in cast iron with NI-ROD "55".

If you want more proof, send for the new Inco folder on NI-ROD and NI-ROD "55". It's called "Repair Cast Iron Parts Quickly and Easily." This folder gives you the actual facts on the success others have had in welding a wide variety of castings with these companion nickel and nickel-iron core electrodes.

The folder also tells you which of the two is generally preferred in different jobs—and the advantages in using them. Write Inco for this valuable folder today.

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK **Welding Products**

Electrodes • Wires • Fluxes

New Weltronic Welding Control

Production Flexibility for High Speed Gun Welders or Standard Machine Applications

A versatile control with one Tube Firing Timer that gives 400 spots per minute or standard operation by the flip of a switch. Meets J. I. C. and Ford W1 specifications. Fail-Safe design. Provisions for plug-in accessories in dust-tight compartment. Has been used by major automotive firms on nearly every welded part—from bumper to bumper. See it in action or write for brochure.

See them in ACTION at the National Metal Exposition*

Features Exclusive Slope Control that Boosts Production 200%

Provides 3-cycle slope at arc initiation and cut-off (a six-time improvement over previous 18-cycle slopes) that has boosted heliarc welding production 200% on a variety of jet engine parts. Eliminates burning at start and stop; permits instantaneous switch-over to different thicknesses. Features a power source, current control and slope control all packaged in one integral unit. To this is added the specialized electronic control (designed to your job) for precise torch head control in three planes. See it in action or write for brochure.

New Inert Gas Shielded Arc Welding Control

Your Solution to Welding Control at Booth 1955*

Come in and work out your problems on the Weltronic application analysis board. See these units in actual operation. Qualified control engineers will be on hand full time to help you.

*Philadelphia Oct. 17-21

Weltronic

WORLD'S LARGEST SUPPLIER OF WELDING CONTROLS

WELTRONIC COMPANY
19500 West Eight Mile Road
Detroit 19, Michigan

Please send your brochure on ☐ New Control ☐ IGSA Control ☐ Put me on your list to receive the Weltimer Magazine.

Name_____ Title_____

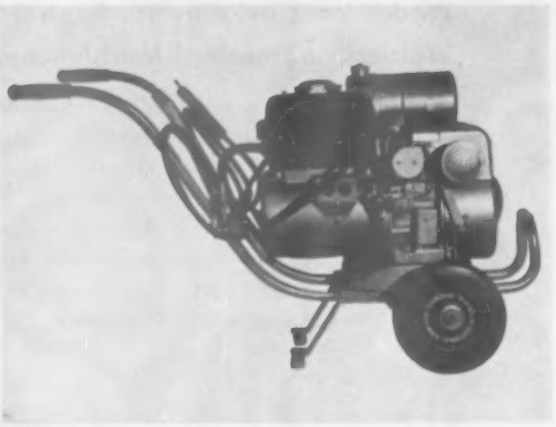
Company_____

Street_____

City_____ State_____

new products . . . . . USE CARD ON PAGE 97

TRACTOR welder travels directly to the job and is ready to weld immediately



PORTABLE generator-welder is a versatile unit for maintenance and repair welding

Tractor welder

MOBILE self-powered welding unit is for welding applications at widely separate points. Termed the "Unitow tractor," the unit travels directly to the job and is ready to weld immediately. It is capable of pulling or pushing up to 70 tons and can tow construction materials.

The tractor has either a 300 or 400-amp generator. A power take-off is mounted atop the transmission, providing power without belts. An all-weather cab, acetylene and oxygen tank bracket with cable reel, snowplow, and rotary sweeper boom may be added.

The unit is 53 in. wide, 138 in. long, and 65 in. high and has a turning radius of 118 in. *United Boiler & Foundry Co.*

Circle No. 1.

* * *

Pyrometer

"LAND surface" portable pyrometer is for difficult temperature-gaging situations. It is claimed to give accurate temperature readings within 0.5%. Suitable for measuring "spot" temperatures from 100 to 2,400 F, it may be used for oxidized steel or cast iron, and many oxidized non-ferrous metals, regardless of their emissivity, states the manuafcturer.

The measuring head, mounted on a telescopic arm, can be extended to 9 ft. It is normally connected by a trailing lead to a portable millivolt meter calibrated in temperature degrees. The instrument head is concave in shape and, when applied to the surface of a hot body, closes off a portion forming a uniform temperature enclosure. The pyrometer is said to produce almost perfect "black body" radiation. *Fielden Instrument Div.*

Circle No. 2.

* * *

Welding torch

PENCIL torch is for inert-gas-shielded arc welding of light metals. The torch, with its 180-deg head, is designed for welding in places that are hard to reach with torches of standard head angle.

The torch is air-cooled and has a 110-amp continuous-duty current capacity. It can join mild steel and hard-to-weld metals like aluminum, magnesium, stainless steel, Monel, Everdur, copper, brass, and high-alloy steels.

Being light and small, the "HW-9" is said to handle easily. Without cable, the 7-in. torch weighs 3 oz and has a maximum diameter of ¾ in. It has a 12½-ft power cable. *Linde Air Products Co.*

Circle No. 3.

* * *

Low hydrogen electrode

SERIES of low hydrogen electrodes designed for all position welding are said to be suitable for welding armor and high strength alloy steels. These electrodes are claimed to have easy slag removal with smooth bead contour. Application is by a-c/d-c or d-c only. Preheating should be used where necessary. Electrodes are packaged in 10-lb. metal cans and are available in 1/8, 5/32, 3/16, 1/4, and 5/16 in. *Pacific Welding Alloys Mfg. Co.*

Circle No. 4.

Generator

PORTABLE, 2,500-watt, electric generator (built by D. W. Onan & Sons, Inc., Minneapolis) is designed to operate any transformer type a-c welder up to 150 amp. The unit so formed can be widely used, states the manufacturer.

Generator has a 3-pole receptacle for quick plug-in. It weighs 152 lb. and is powered by a single-cylinder, 4-cycle, air-cooled gasoline engine. The generator is manually started with a pull rope, a recoil pull rope starter is available.

This generator comes mounted on a lightweight, two-wheeled dolly, or a welded tubular steel carrying frame. *Royal Arc Industries, Inc.*

Circle No. 5.

* * *

Grinding wheels

"CARBOFLEX" abrasive wheels are reinforced with fiber glass fabric. They are said to have a high safety factor at speeds up to 16,000 surface feet per minute. Such wheels, claims the manufacturer, have a high flexural strength index of 7,000 and an impact strength rating of 400 ft. lb.

Since fiber glass is a ceramic material (like the abrasive) it wears evenly at almost the same rate as the abrasive, instead of fraying or glazing.

The wheels are available in thicknesses of ⅛ to ⅜ in., and diameters of 2 to 20 in. They may be used for roughing-off fins and sharp edges, notching and cutting off gates and risers, and removing burned sand and cleaning castings. *The Carborundum Co.*

Circle No. 6.

ONE wide-range "OXWELD" W-45 BLOWPIPE handles EVERY welding and heating job

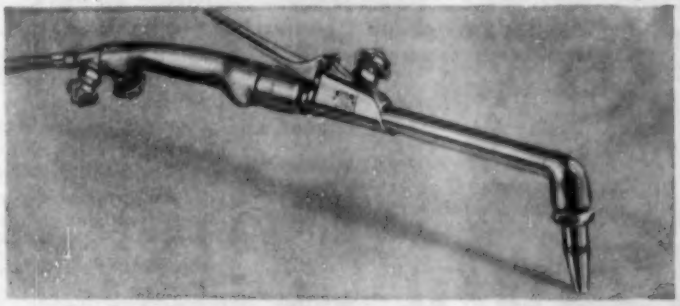
Trade-Mark

NO OTHER SINGLE BLOWPIPE OFFERS THIS EXTENSIVE RANGE!

Anyone whose daily work includes welding and heating will readily appreciate the amazing wide range and versatility of the new OXWELD W-45 Blowpipe. Its 18 head sizes (2 to 300 cu. ft. per hr. capacity) provide a perfect flame for every metal thickness. Light sheet to heavy plate, *one blowpipe does it all!*

From chrome-plated tip to offset hose connections, the W-45 shows the results of over a decade of development work by LINDE engineers. Its exclusive "jiffy-lock" heads, "form-fit" handle, and advanced styling are as modern as guided missiles and atomic power. "O" ring gas seals, flame-stabilizing mixers of improved type, and many other innovations put this blowpipe far ahead of the field in economy, ease of operation, and low-cost maintenance.

See for yourself how you can enjoy tomorrow's operating standards today with an OXWELD W-45 Blowpipe. Ask your LINDE representative for a demonstration, or write for free booklet, F-8684.



CW-45 Cutting Attachment adapts the W-45 Blowpipe for cutting steel up to 8 inches thick.

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)

The terms "Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde
Trade-Mark

FIR TREES FOR ACETYLENE CYLINDERS?

The inside story of the superiority of Norris-Thermador Acetylene Cylinders is the charcoal type monolithic filler. The charcoal used as one of the filler components comes from selected Washington fir of a very special quality. The trees used are those grown at a certain altitude, and must be of a specific age, height, and diameter of limb. This special charcoal, manufactured under controlled processing conditions, must always conform to rigid Norris-Thermador standards—both as to the type of wood itself and size of granule. It combines perfectly with the other filler components of diatomaceous earth, asbestos, and cement to provide a filler which holds more gas and hugs the inside cylinder wall to assure better welding jobs and greater safety.

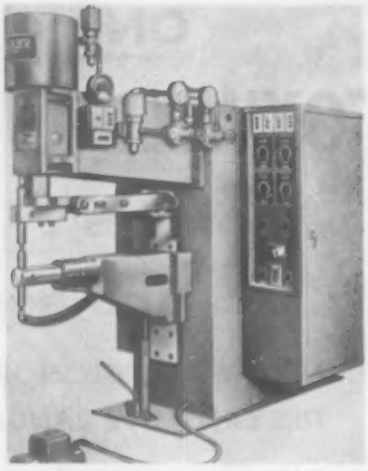
OTHER EXTRA VALUES

Check them: Cold-drawn construction . . . light-weight for easy handling . . . bases curled under for maximum strength and compact storage . . . larger cap holes—tags easily read without moving caps . . . all welding X-ray controlled . . . specification ICC 8 met and exceeded.

Acetylene cylinders from 10 to 300 cubic feet capacity. Write or wire for specifications on all sizes. Cable: Northerm

NORRIS-THERMADOR CORPORATION

5215 South Boyle Avenue, Los Angeles 58, California. Dept. WE 955



Spot welder

THREE-phase "Modu-Wave PMCO 2ST" resistance spot welder is an air operated, press type. It is one of a series of sizes ranging from OST through 7ST.

This welding machine is designed for large production runs on a wide range of low carbon steel, austenitic steels, aluminum and magnesium alloys, etc. It is particularly useful in the aircraft industry, states the manufacturer.

It is available in 100 kva at 50% duty cycle and can be had with either 36, 48 or 54-in. throat depths, and electrode force up to 4,300 lb. at 80 psi line pressure. *Sciaky Bros., Inc.*

Circle No. 7.

* * *

Glass cleaner

"SEECLOTH" is a chemically treated fabric for simultaneously cleaning and mistproofing glass or transparent plastic. A surface wiped with this fabric is said to remain clear for a period of a few hours to two weeks.

The cloth can be reused. It is particularly useful for masks and goggles. Available in pieces 3 by 8 in.; 8 by 9 in. and 16 by 18 in.; or by the yard. Special sizes cut to order. *Hygiene Research, Inc.*

Circle No. 8.

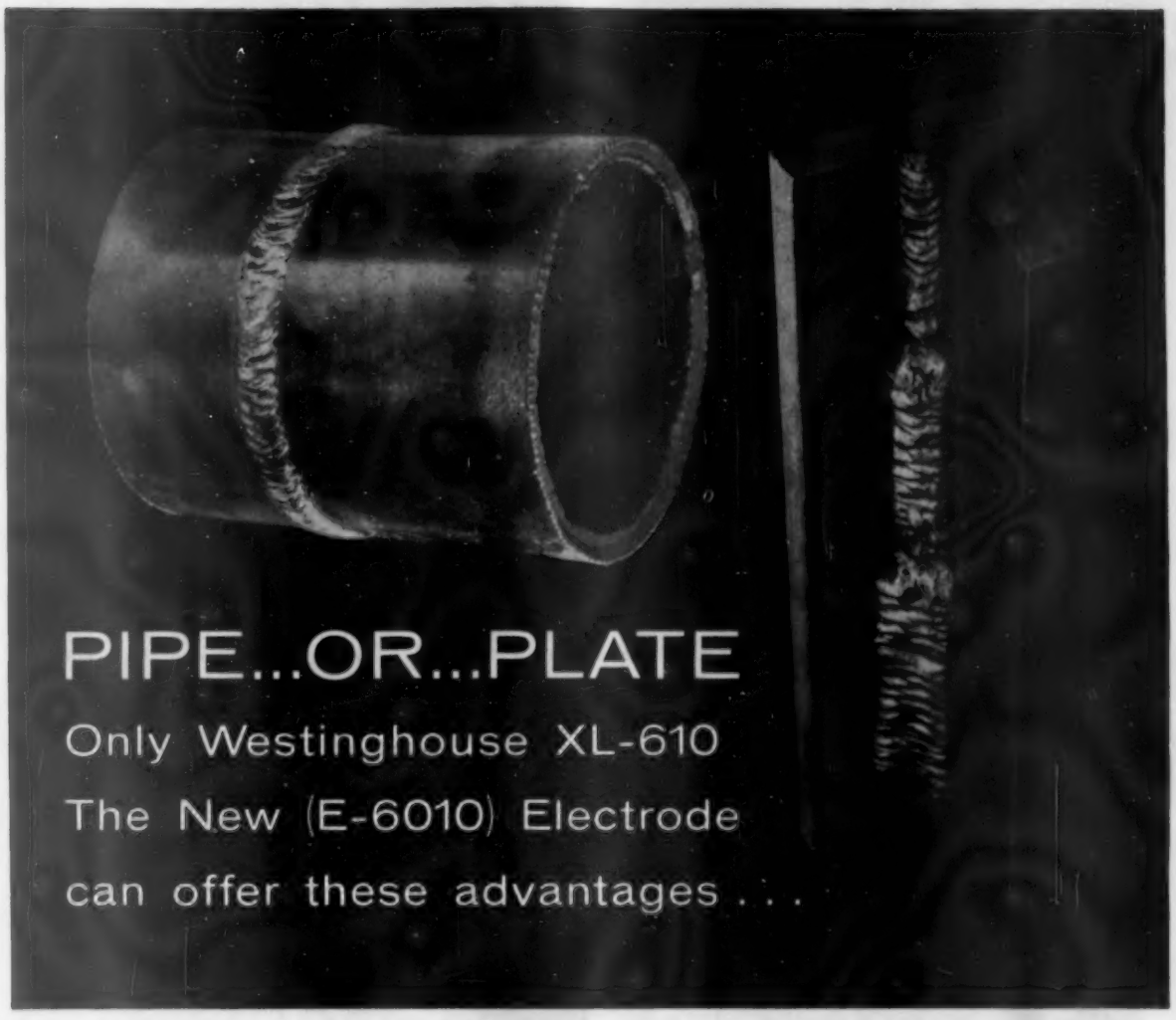
* * *

Beryllium copper alloy

"SILVERCOTE," tempered beryllium-copper wire, has tensile strength of 185,000 psi and is claimed ductile enough to wrap around its own diameter. Manufacturer states further heat treatment of finished parts of this wire is unnecessary. *Little Falls Alloys, Inc.*

Circle No. 9.

For more information use card on page 97



- Pinhole-free, x-ray quality welds in any position. Fewer rejections, faster production, better quality work.
- Feather-touch slag removal—cleaning time reduced to an absolute minimum.
- Deep penetration for root pass welds. Makes XL-610 especially suited to heavy plate fabrication, pipeline, shipyard, pressure vessel and construction work.
- Extremely low spatter loss, even with high currents. Higher deposition rates, easier cleaning.
- PLUS these exceptional "physicals". . .

J-21911

YOU CAN BE SURE...IF IT'S Westinghouse

ABS Specifications	Westinghouse XL-610		
	1/8"	3/16"	1/4"
Percent elongation in 2" . . 22%	28	28	34
Yield strength, psi 50,000	52,900	54,800	53,800
Ultimate strength, psi . . . 62,000	65,900	64,500	62,400

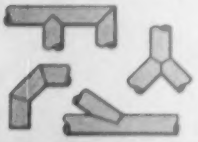
WESTINGHOUSE ELECTRIC CORPORATION
Welding Dept., Box 868
Pittsburgh 30, Pa.

Gentlemen: Please rush full information plus samples on new Westinghouse XL-610.

Name_____ Title_____
Company_____
Street & No._____
City_____ Zone_____ State_____

LAY OUT ANY PIPE JOINT

LAY OUT ANY PIPE JOINT, SHOWN BELOW, on any size pipe from 1½" to 48"



Mark Structurals
Adapter for marking structural angles included with either model of the Contour Marker.

The proven, fast easy way

IN LESS THAN 5 MINUTES you can lay out a Y, a T, an L or any angle joint with a Contour Marker. IT'S EASY and absolutely accurate; it is calibrated in both degrees and pitch. Just set the angle and with a smooth swing of the Contour Marker's soapstone point you are ready to cut! You save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are eliminated.

Two Sizes: Standard, for pipes 1½" to 18" dia.; Jumbo, for pipes 16" to 48". Instruction book included. Belt case available. Write for information.

Sold by welding supply dealers everywhere.

CONTOUR MARKER CORP. OF CALIFORNIA
1843 East Compton Boulevard, Compton, California

BOYCE CENTERING HEAD marks *center line* at any degree of angle on pipe, shaft, tube. Leveling gauge on dial.

24" RADIUS MARKER is folding compass of Dural aluminum. Folds to 9¼" pocket size; weighs 8 oz.

PIPE FLANGE ALIGNER expands and centers inside pipe to align flange for welding. For any pipe dia. 3" to 12"

THE *Original* CONTOUR MARKER
ACCURACY PROVED BY TEN YEARS OF SERVICE TO WELDERS

***TWECO-LITE**

Send for FREE CATALOG

***TWECO-LITE,** the new flexible ALUMINUM welding cable that weighs half as much, costs less and lasts longer.

a product of TWECO PRODUCTS CO. Wichita 1, Kansas

Induction heating

MODEL "LI-3" is a 3-kw, high-frequency, induction-heating unit designed for brazing, soldering, hardening, and other light heat-treating applications.

Unit is the single-station type with variable auto-transformer, providing stepless variable control of continuous power from 0 to 3 kw. Thermal output is 170 BTU per minute at a frequency of 400 kc. Manually-operated transfer switch is available for two-station operation.

An all-steel cabinet minimizes radio-frequency radiation. A double compartment shields oscillator from the d-c power supply and controls. Space is provided for safe operation and easy access to internal parts.

Unit has a precision synchronous timer; all controls are accessible from outside. Auxiliary work-handling equipment is available. *Lindberg Engineering Co.*

Circle No. 10.

* * *

Welded chain

"X-WELD" steel chain is said to be a stronger, more durable chain. By inserting and welding separate pieces of steel between the butted ends of each formed link the weld area is increased, and produces a weld said to be stronger than the chain link. The inserted metal becomes a stop midway in the link, stopping kinking.

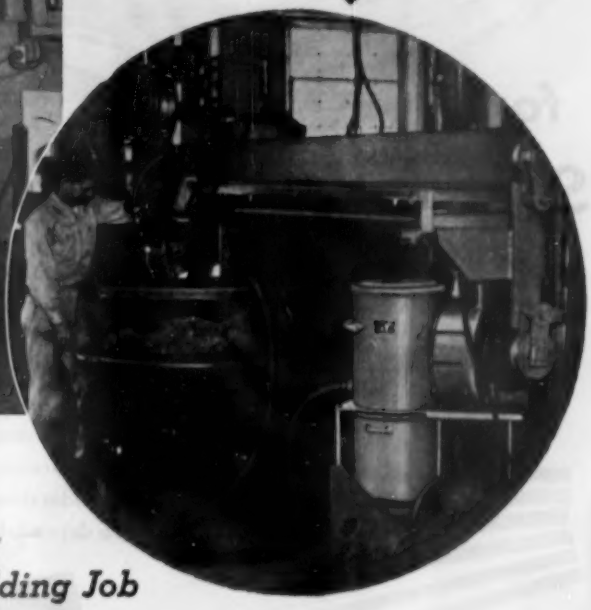
For high temperature use, a stud chain of stainless steel, type 321, and a super stainless steel chain are available. There are five sizes ranging from ¼ to ¾ in., with working load limits of 3,250 to 23,000 lb. *American Chain & Cable Co., Inc.*

Circle No. 11.

INVINCIBLE
Flux Recovery Systems

Fully automatic flux recovery in continuous flow by Invincible Model 482.

Salvaging flux the modern way with the portable Invincible Model 460.



there's a type "Tailor Made" for your Submerged Arc Welding Job

Invincible Flux Recovery Equipment is designed to save you money. Here is how Invincibles quickly repay their cost and give you years of trouble-free service:

Save ***VALUABLE FLUX*** —Invincibles recover all unfused flux from the work, remove fine dust and fused particles, return slag-free, dust-free, fusible flux to the hopper of the welder.

Eliminate **COSTLY MAN-HOURS**—Invincibles do the whole job automatically, more rapidly and efficiently than manual methods . . .

Reduce **EXPENSIVE REJECTS**—By removing all fine dust (flux flour), Invincibles reduce welding rejects and step up production.

Invincible users report big savings and complete satisfaction. These same results can be yours—there's an Invincible Flux Recovery Unit for any job, regardless of its size or type.

Send for folder of Invincible Flux Recovery Equipment at work. It describes and illustrates our complete line.

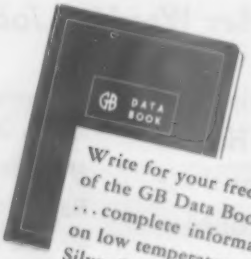
INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO
OVER 30 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

Use GB Silver Brazing Alloys and Fluxes for

Speed • Efficiency • Economy

...GB Silver Brazing Alloys meet all standard specifications. Available in random coils, strip, preformed rings and special shapes. This is your answer to sound, leak-proof joints on virtually any ferrous or non-ferrous metal. Silver Brazing Alloys are easy to use in production, save time, labor and assure dependable results.

GB 88 Flux, an aid in silver brazing operations, a time-tested product, assures you of maximum protection and high quality joints. Team up a GB Alloy and Flux for dependable results. Other GB Fluxes available for specialized application.



Write for your free copy of the GB Data Book ... complete information on low temperature Silver Brazing.

Dealer Distributor inquiries invited

Goldsmith Bros. SMELTING AND REFINING CO.
1304 W. 59th Street, Chicago 36, Illinois
Suppliers of Precious Metals to Industry Since 1867

PLEASE SEND GB Data Book without obligation.

Name_____

Address_____ City_____ State_____

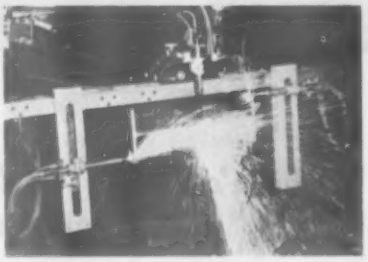
Welding positioner

"UP-1000" is a universal-balance welding positioner capable of placing pieces weighing up to 1,000 lb. for downhand welding, manufacturer claims. It occupies a floor area of 22 by 26 in. and weighs 200 lb.

Operation is simple, although manual, states manufacturer. Weldor merely clamps work piece to the table and adjusts spring tension with a crank. The unit remains in static balance even though the weldment is rotated or moved. Positioner is easily guided by hand to desired angle. *Harnischfeger Corp.*

Circle No. 12.

• • •



Flame saw

FLAME-saw for cutting heavy steel structurals is hand-portable and can be set up anywhere in the plant or on the job, it is claimed. It is said to reduce handling, set-up and operating costs, and to increase speed and accuracy of cutting at any angle.

Unit requires only 110-volt power supply with a set-up of oxygen and fuel gas. Machine can cut structurals 3 to 36 in., any angle miter cut. Addition of extra length of track and a radius rod adapts saw to straight line or circle cutting. Cutting speed is a 24 in. beam in one minute, manufacturer states.

Unit has a roller-bearing-wheeled, table-height, tubular steel carriage. *The K-G Equipment Co., Inc.*

Circle No. 13.

For more information use card on page 97

It all adds up!

Arc and Thermit welders for years have looked to Metal & Thermit for the electrodes, machines, and accessories they need, and for the research, engineering data, technical assistance, and ordering convenience that Metal & Thermit can offer. To the thousands of welders specifying M&T equipment, it all adds up to profitable welding.

You, too, can enjoy the same unsurpassed purchasing economy and technical assistance by which so many others profit. Write now or call your M&T man for information on your requirements. There's one near you.

M&T welding products include:

MUREX ELECTRODES for

mild steel — aluminum bronze
low alloy steel — cast iron
stainless steel — aluminum
hard surfacing

M&T WELDING MACHINES

A.C. transformers — D.C. motor generators
D.C. rectifiers — D.C. engine driven
Inert arc

M&T WELDING ACCESSORIES

holders — helmets
cleaning tools — lugs
cable — gloves
ground clamps

THERMIT WELDING MATERIALS and ACCESSORIES

for the fast, low-cost fabrication and repair of heavy equipment.

In Shipbuilding as in other great industries
MILLER WELDERS are preferred

St. Louis Shipbuilding and Steel Co., largest builders of inland towboats in the world, require welds that will withstand a maximum amount of abuse.

Look anywhere in St. Louis Shipbuilding's mammoth yard and you will see Miller Selenium Rectifier type D.C. arc welders—in single units or in batteries of four and five for greater output.

For dependable welds, St. Louis Shipbuilding prefers the Miller S.R. welder. Miller is glad to be aboard.

ARC - SPOT miller SELENIUM RECTIFIERS WELDERS

Miller Selenium Rectifier type D.C. Arc Welders are available in four wide range models. For complete information on these and other Miller arc and spot welders, contact us today at no obligation, of course.

miller
ELECTRIC MANUFACTURING COMPANY, INC.
APPLETON, WISCONSIN

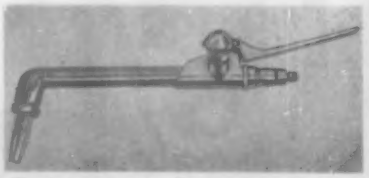
Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal, P.Q.

*TWECO-LITE

Send for FREE CATALOG

***TWECO-LITE,** the new flexible ALUMINUM welding cable that weighs half as much, costs less and lasts longer.

a product of TWECO PRODUCTS CO Wichita 1, Kansas



Cutting attachment

CUTTING attachment "CW-45" is designed for conversion of a "W-45" blow-pipe into a cutting torch. Capable of cutting steel 8-in. thick, the attachment operates on acetylene pressure of 5 psi, claims manufacturer.

The attachment is intended for intermittent cutting in contract welding shops, manufacturing plants, shipyards, steel fabricating and maintenance shops.

The attachment connects to the torch handle in the same manner as a welding head. A coupling nut locks it in place by means of a circular contracting spring. Head angles of 75 or 90 deg are available. *Linde Air Products Co.*

Circle No. 14.

* * *

Torch gas cup

TRANSPARENT gas cup is for use on "Visuweld" Tig welding torch. Cup is said to give unrestricted view of weld and is claimed to outlast ceramic cups. It is made of specially treated quartz or pyrex. *Tec Welding Co.*

Circle No. 15.

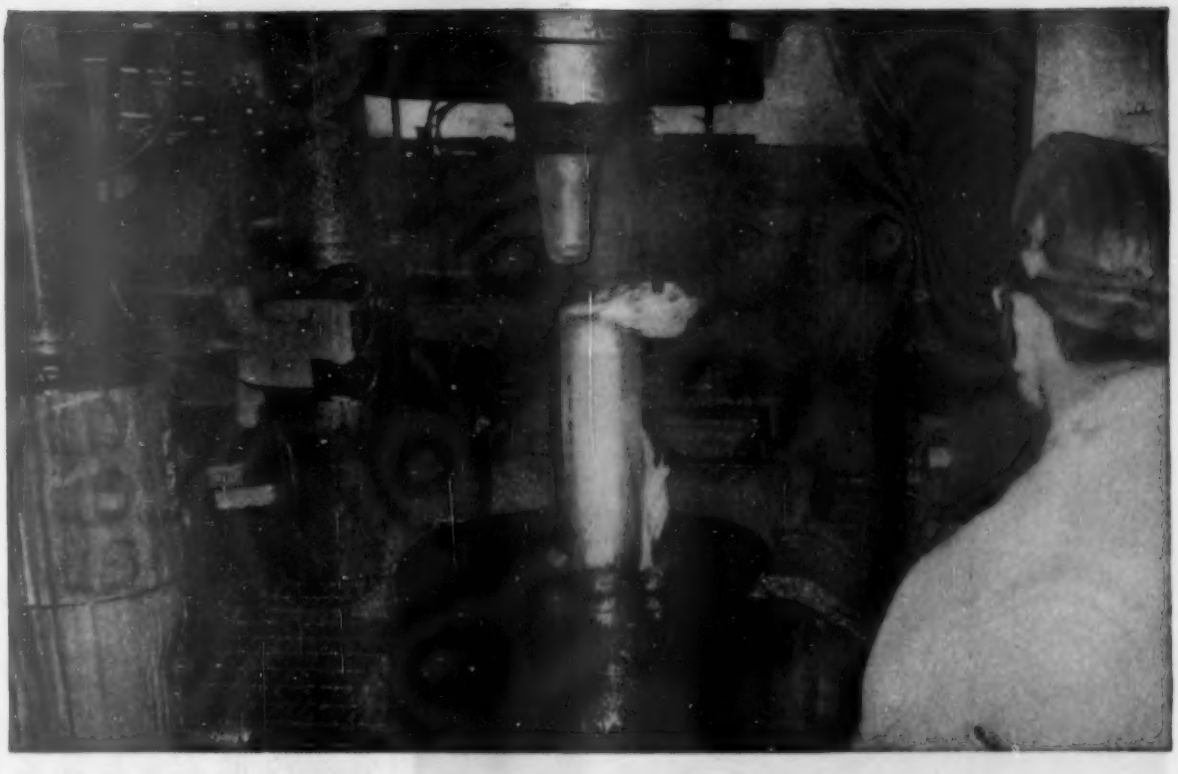
* * *

Pyrometer converter

LINEARIZING cam, said to be capable of converting a non-linear thermocouple millivolt signal into a straight-line uniform form for recording and control, is available for attachment to "Dynamaster" thermocouple pyrometers.

The device converts a non-uniform analog into linear form for feeding into a digital readout device. *The Bristol Co.*

Circle No. 16.



Die Pot Life Increased 350 Per Cent

A deposit of HASTELLOY alloy C hard-facing rod has more than tripled the service life of the die pots used in this slugging and piercing operation. The hard-faced parts are exposed to severe impact and abrasion at high temperatures. Press tonnages required to perform the operation have been reduced from 30 to 50 per cent since the pots have been faced with HASTELLOY alloy C. This rather unusual plus value is due to the low friction characteristics of this nickel-base alloy.

Resists Chipping and Spalling

HASTELLOY alloy C is a tough, machinable, hard-facing alloy that can be applied to all common die steels. It has high tensile strength, good ductility and excellent resistance to chipping and spalling. It can be applied by the metallic-arc process, flows smoothly, and produces sound deposits. No special heat-treating or cooling procedures are needed.

No Grinding or Peening

When deposited, HASTELLOY alloy C has a hardness of 210 Brinell, and can be machined easily by ordinary die-sinking tools. Then the deposit work hardens, in service, to about 375 Brinell without deformation. Its work-hardening characteristics eliminate the necessity for peening the deposit to obtain maximum wear-resistance.

For information on procedures for applying and for available sizes and prices, write for the booklet "HASTELLOY Alloy C—A Machinable Hard-Facing Alloy."

"Haynes" and "Hastelloy" are registered trade-marks of Union Carbide and Carbon Corporation.

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

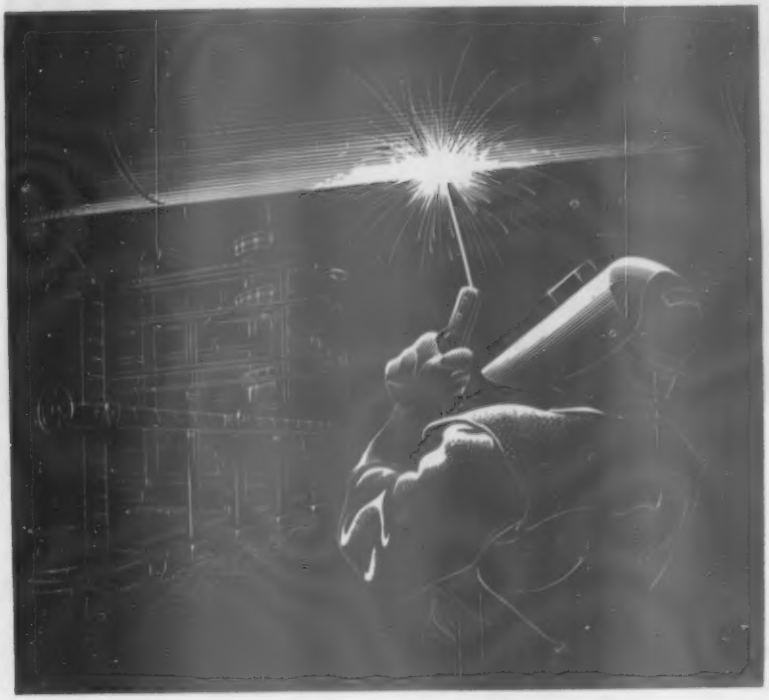
UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago · Cleveland · Detroit · Houston · Los Angeles · New York · San Francisco · Tul

New ARCALOY
502 LIME ELECTRODES
for x-ray quality welds
in 4 to 6% Chrome Steels



New Arcaloy 502 lime electrodes produce welds of required x-ray quality in 4 to 6% chrome steels as required for high temperature, high pressure services. Arcaloy 502 electrodes have a new lime, low hydrogen type coating, *a coating that will not fingernail*, eliminates underbead cracking and provides a basic slag with a scavenging action that consumes impurities.

The New Arcaloy 502 lime electrodes have excellent weldability *in all positions*, with an arc action smooth and stable, an easy-to-control weld metal and slag. Arcaloy 502 electrodes conform to A.W.S. A5.4 and A.S.T.M. A298-55T Specifications, Grade E502-15. Try the New Arcaloy 502 electrodes for x-ray quality welds in your high temperature, high pressure applications. Contact your Alloy Rods Distributor or write the plant for all the facts.

Alloy Rods Co.

General Offices and Plant • York 2, Penna.
Pacific Coast Sales Offices and Plant
El Segundo, California

no finer electrodes made . . . anywhere

Portable welder

GENERAL Electric's "Fillerarc" welder has been made portable by installation on a specially built cart. The welding generator and a 40-gal water-circulating system is mounted on the cart platform. The water-circulating system has a motor-driven geared pump which is said to properly cool the welder's gun.

The wire-drive unit is mounted on a table, free to swivel, enabling easy movement and eliminating kinking of cables, tube and hose. Space is provided at the rear of the cart for two bottles of gas.

The cart is made of heavy steel plate and has four 8-in. diameter wheels with 2-in. diameter tires. Front wheels swivel. *Machinery & Welder Corp.*

Circle No. 17.

* * *

Plastic insulator

THE "Amazi" plastic welding insulator is claimed to have more adhesiveness than other plastics. It is said to adhere equally well to flat or round surfaces, metal, plastic and other surfaces.

A paste-type of insulation, "Amazi" is easy to apply, taking about 7 minutes. Application to welding points, point holders and other trouble spots where metal being welded is likely to come in contact with welding equipment gives a smooth, non-peeling, plastic surface of cement-like hardness that is not brittle and does not conduct electricity.

Insulator is available in 1, 10 and 50-lb containers. *Amazi Reliner Corp.*

Circle No. 18.

* * *

Metal disintegrator

"JIFFY" metal disintegrating machine is said to operate quickly and efficiently without use of electronic tubes, rectifiers or condensers. It is designed to remove broken taps, drills, etc. *Jiffy Disintegrators Inc.*

Circle No. 19.

Weldor's eye shield

DETACHABLE shield can be clipped to the inside lens holder of any standard welding hood to eliminate light entering from the side or rear.

Known as "Sight-Guard," the shield is molded from sponge rubber on a flexible frame, with clips that snap onto the lens holder. Shield weighs 2 oz; ventilation is provided to prevent fogging. *Byers Supply Co.*

Circle No. 20.

* * *

Welding machine

DOUBLE end welder is a resistance-welding machine designed for production of automotive transmission bands. It is said to cut time and costs by simultaneously joining both ends of a strip of steel to a forging.

No special preparation of the forging is necessary, claims the manufacturer. After welding, the joints are broached free of flash; forging is severed between its bosses and machined to complete the band. The welder may be adjusted for many band sizes and forging shapes. *The Taylor-Winfield Corp.*

Circle No. 21.

* * *

Solvent welding fittings

SOLVENT-welding pipe fittings and flanges of injection-molded, unplasticized, polyvinyl chloride are said to permit fast easy installations.

Since both the fitting connecting surface and the pipe-connecting surface are smooth, there is no notch effect. Use of these fittings is recommended where installations are to be permanent. *Tube Turns Plastics, Inc.*

Circle No. 22.

For more information use card on page 97

From any angle...

YOUR BEST ELECTRODE

ATOM·ARC

The ONLY All-Position Iron Powder Low Hydrogen Electrode

7016
8016N (3½% Ni.)
8016CM (1¼% Cr., ½% Mo.)
9016CM (2¼% Cr., 1% Mo.)
10016MM (1.70% Mn., .40% Mo.)

- X-ray quality weld metal
- No starting porosity
- More pounds of weld metal per electrode used
- Outstanding physical properties
- Smooth, uniform weld bead in all positions
- No moisture pick up

Alloy Rods Co.

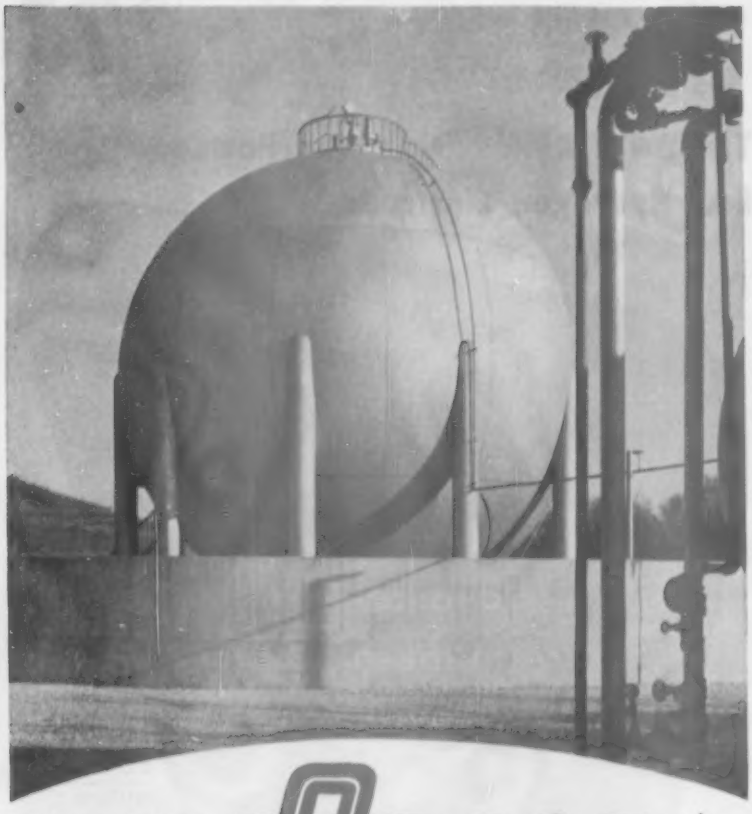
Get the complete story now...

Write today for your copy of the ATOM • ARC Bulletin — it tells you what you want to know about this revolutionary new electrode.

General Offices and Plant • York 2, Penna.
Pacific Coast Sales Offices and Plant • El Segundo, Calif.

no finer electrodes made . . . anywhere

For speed, economy and dependability when welding low-alloy steels...



WELD WITH ARCOS

LOW HYDROGEN ELECTRODES

When welds *must be strong*—as in the Hortensphere* pictured above—ARCOS Low Hydrogen Electrodes will do the job. Usable in all positions, they produce uniformly high quality welds to meet the most rigid inspection standards. Time and money will be saved by eliminating preheat and by avoiding costly repair welds. ARCOS CORPORATION, 1500 South 50th St., Philadelphia 43, Pa.

*Trademark registered by Chicago Bridge & Iron Co.

Flux

ALL-purpose soft soldering "Flux Kit" will prove time saver, manufacturer claims. The set includes printed-circuit, electronic and general-purpose fluxes. There are 16 varieties in all, each in labeled glass bottles. Chart on carton flap indicates positions of flux in carton. *Alpha Metals, Inc.*

Circle No. 23.

* * *

Plastic welding kit

COMPLETE welding kit supplies tools and information for welding thermoplastics. Kit contains 110-volt welding gun with nozzle, 15-ft nitrogen hose, electrical connections, nitrogen flowmeter, contour marker, porosity spark tester, marking crayons, and cutting-trimming knife.

Two books, "Welding of Plastics" and "Plastics Welding Manual," are also included. *American Agile Corp.*

Circle No. 24.

* * *

Fluxes

NEW line of agglomerated fluxes is for automatic submerged-arc welding of low-alloy steels. Fluxes contain alloying elements which may be changed as required by a particular job. They may be used with a mild-steel electrode, and are said to produce a low-alloy deposit.

The fluxes available can be compounded to give weld-metal of the following elements, in varying amounts —chromium, molybdenum, vanadium and nickel. Alloys may also be added to the weld through the flux when an alloy electrode is used, states the manufacturer.

Adding alloys to the weld deposit through the flux is said to have these advantages: the agglomeration process of manufacture permits control of flux analysis; small changes in deposit analysis can be made through welding-procedure control, without changing the flux or wire composition. *The Lincoln Electric Co.*

Circle No. 25.

LETTERS . . . . *from page 8*

much appreciate having two copies of the first article which appeared in the March, 1955, issue. We desire these copies to place in our files for use in engineering reference and information.

Henry B. Norman
Puget Sound Naval Shipyard

—Tear sheets were sent.

* * *

Stainless steel

Dear Sir:

In the February (1955) issue of WELDING ENGINEER, p. 40, you published an article on "How to arc weld the different types of stainless steels —I," by Lester F. Spencer.

In it, he says that Group A comprises the austenitic stainless steels, containing both chromium and nickel; Group B, the martensitic, or straight, chromium steels, which contain chromium from 11.5 to 18.0% and little or no nickel; Group C, the ferritic steels, having no nickel and, usually, chromium in excess of 18.0%.

Now then, get your *Mechanical Engineer's Handbook*, fourth edition, by Lionel S. Marks. Turn to page 587. The headings are: Group A—Martensitic; Group B—Ferritic; Group C—Austenitic.

William M. Fitzsimmons
Paducah, Ky.

—The group listings do not mean anything in particular—they could just as well be called "X, Y and Z." Austenitic, martensitic and ferritic stainless steels were properly described in WELDING ENGINEER, *and, if you check our definitions against Marks', you will see we are talking about the same things, although we use different group headings. Sorry to have caused any confusion.*

* * *

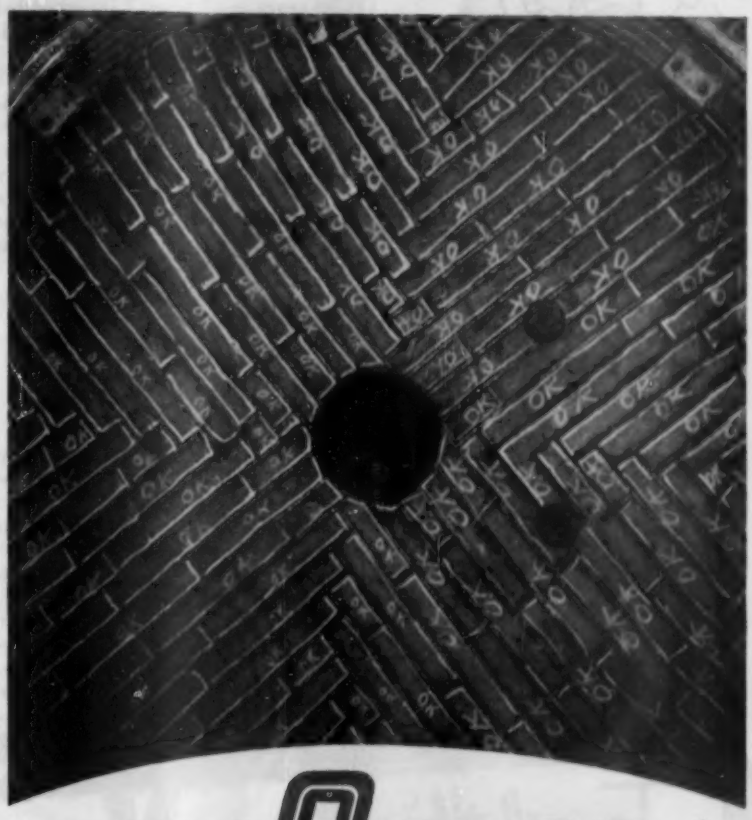
Early history

Dear Sir:

Upon reading "Early History" on page 8 in the July WELDING ENGINEER, it makes me feel good to notice names of such good old hand workers and acquaintances as Charlie McCune and Bill Sparagen, and to remember the days when Mr. L. B. Mackenzie started out with WELDING ENGINEER.

I have been a subscriber since the early days and have been practicing welding since 1898. Mr. Mackenzie knew me well. We exchanged many letters. I have been in business for myself since 1908 (in New York) and started the first welding shop in

How to get the "OK" on stainless welds . . . time after time



WELD WITH ARCOS

STAINLESS ELECTRODES

On weld after weld—such as in this refinery tower lining which must resist intense corrosion—Arcos quality controlled electrodes will give you the "right" weld metal . . . easily deposited. If you are looking for sound, low cost, long-life welds—you can rely on Arcos *ELECTROPAKED* Electrodes to produce unquestioned "OK's" time after time. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

WELDING IN HIGH PLACES IS EASIER WITH

*TWECO-LITE

*the new ALUMINUM welding cable that weighs half as much, lasts longer and costs less

Send for free catalog

A Product of
TWECO PRODUCTS COMPANY
Wichita 1, Kansas

Morris County, N. J., in 1914. I was an early member of the American Welding Society.

Now I also notice your mention in "30 years ago," when I incorporated under the name of Morristown Welding & Radiator Co., Inc.

For general information, when I did this I hoped to sell stock to finance patent developments. I never sold any stock, dropped the incorporation and carried on under my name until I retired about eight years ago. Thanks for welding and best wishes for further developments in the great and endless track.

Leo Kappertz
Morristown, N. J.

* * *

Well-Wisher

Dear Sir:

Thank you for your interest in my reasons for discontinuing my subscription to WELDING ENGINEER.

After 35 years in the welding industry, I have retired and, will be unable to renew my subscription to your magazine.

However, WELDING ENGINEER has filled every need in keeping me informed on current and new procedures and has been my guide for many years. Although I have subscribed for 6 years, I have had access to WELDING ENGINEER for many more years, and I can speak very highly of the magazine and what it has done for the industry as well as the weldor.

F. S. Moore
Los Angeles, Calif.

* * *

Realistic dreams

Dear Sir:

Our "dreams" were similar . . . .

William A. Rice
Virginia Welding Supply Co.

—See editorial, WELDING ENGINEER, *July, 1955, p. 15.*

* * *

Welding control

Dear Sir:

I am interested in getting more information on the article entitled "Automatic arc control", WELDING ENGINEER, p. 34, July, 1955. Particularly, the manufacturer of the welding machine described by the author, Mr. Clarence Bennett.

Stephen J. Kolinko
Kollsman Instrument Corp.

—Mr. Kolinko has been referred to Mr. Bennett at Vickers Electric Div., St. Louis, Mo.

Tempilstik° FOR ALL HEAT-DEPENDENT OPERATIONS

looks like a crayon... marks like a crayon... tells temperatures like a precision instrument!

Sixty-three different compositions enable you to determine and control working temperatures from 113° to 2000° F. TEMPILSTIK° marks on workpiece "say when" by melting at stated temperatures—plus or minus 1%.

ALSO AVAILABLE IN LIQUID AND PELLET FORM...WRITE "WELDING SALES" DEPT. FOR SAMPLE TEMPIL° PELLETS...STATE TEMPERATURES OF INTEREST—PLEASE!

Tempil° CORPORATION
132 WEST 22ND STREET, NEW YORK 11, N. Y.

Available in these Temperatures (F.)

113	375	1000
125	388	1050
138	400	1100
150	413	1150
163	425	1200
175	438	1250
188	450	1300
200	463	1350
213	475	1400
225	488	1450
238	500	1500
250	550	1550
263	600	1600
275	650	1650
288	700	1700
300	750	1750
313	800	1800
325	850	1850
338	900	1900
350	950	1950
363		2000

Visit us at Booth 1533—Oct. 17-21
Nat'l Metal Exposition
Philadelphia

NEWS . . . . . *from page 6*

New York City, under the Industrial Participation Program of the AEC. The firm will investigate nuclear power equipment, such as small power reactors and specially designed components of reactors.

• • •

American Wheelabrator changes corporate name

American Wheelabrator & Equipment Corp., Mishawaka, Ind., has announced change of its name to Wheelabrator Corp. The move does not involve any change in ownership, management or operation.

• • •

New vacuum melting furnace in operation

A new semi-continuous, 1,000-lb. vacuum melting furnace was recently placed in operation at the Carboloy Dept., General Electric Co., Detroit. The new unit is said to make possible creation of new alloys from lower-cost, less critical elements having equal, or better, structural properties than those produced by air melting.

• • •

Wire Institute elects new president

At a recent meeting, Richard H. Frizzell, sales manager of the structural products dept., Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., Buffalo, N. Y., was elected president of Wire Reinforcement Institute, Inc., Washington, D. C.

The Institute is a non-profit trade association of manufacturers and producers of steel welded-wire fabric. Mr. Frizzell will direct a program aimed at improving welded wire fabric and the products it reinforces.

• • •

Crawler tractor weighs 56,000 lb

Production of a 230-drawbar horsepower crawler tractor with a turbocharged engine was recently announced by Caterpillar Tractor Co., Peoria, Ill. The tractor, weighing 56,000 lb., is said to be the world's biggest, most powerful production crawler. It is the result of 10 years of tractor research and development.

An important feature is welded fabrication of the steering clutch case and main frame, providing a rugged backbone for the tractor assembly. The tractor also has a one-piece welded track roller frame.

a helping hand means... better rods for you

Welding rods with RUFLUX* in the coating offer worthwhile advantages. What these advantages can mean depends upon which RUFLUX product is used. For RUFLUX is a TAM* trade name which stands for the highest quality Rutiles, Titanates and Zirconium compounds.

A TAM sales engineer can give you the facts quickly and accurately. He is technically trained and is familiar with the properties of the various TAM RUFLUX products. Furthermore, he is supported by a well-equipped and staffed research laboratory offering every available assistance.

This combination offers you a helping hand to better welding rods.

TAM PRODUCTS
Registered U. S. Pat. Off.

TITANIUM ALLOY MFG. DIVISION
NATIONAL LEAD COMPANY

Executive and Sales Offices:
111 Broadway, New York City
General Offices, Works and Research Laboratories:
Niagara Falls, New York

*Ruflux and TAM are registered trademarks.

STOP
FUMES
at their
source
You'll find Ruemelin Fume Collectors ideal for stopping noxious welding fumes at their source. Counter-balanced inlet hood stays in working area, automatically. Improves working conditions . . . lessens fatigue . . . paves the way for increased plant production. Thousands in everyday service. Write for Fume Collector Bulletin No. 37E.
(Left) "Illustrating the 15 ft. reach collector. Handles large or small work. Units available with 15 ft., 17 ft. and 20 ft. reach."

RUEMELIN MFG. CO.

MFRS. & ENGRS. • SAND BLAST & DUST COLLECTING EQUIPMENT
3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

cut weld cleaning time by 85%

Throw away your cold chisel and whisk off weld spatter with a dry rag! Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time — P-O-M compounds quiet the arc, improve fusion and electrode operation, prevent oxidation and annealing scale, cause no porosity. No smoke, odors, or fumes.

P-O-M No. 2. Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.25 per gallon, f.o.b. Dayton.

P-O-M No. 8. Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of sub-assemblies. $3.30 per gallon, f.o.b. Dayton.

MONEY-BACK TRIAL OFFER

Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

PROTECT-O-METAL

G. W. SMITH & SONS, INC. 5408 KEMP ROAD, DAYTON, O.

After 56 years, Mazy calls it a day

Employed as private secretary to the president of Champion Rivet Co., Cleveland, Miss Mazy Mullarky recently retired after 56 years of service.

Miss Mullarky joined the firm at the age of 17, just out of school. The company was only 4 years old then, and Miss Mullarky was the first woman employee. She was secretary during the long association to two presidents, father and son—David J. and Pierre Champion.

Miss Mullarky shared in the excitement when the firm landed contracts to supply rivets for such historic structures as the Panama Canal and the Golden Gate Bridge. On her 50th anniversary as secretary, Pierre Champion gave a party in her honor. When it was suggested at that time that she shorten her working hours she declined and continued working full time.

• • •

NWSA holds 2 zone meetings this month

The National Welding Supply Association will hold the Eastern Zone meeting, Sept. 15-16, at the Sheraton-Mt. Royal Hotel, Montreal. On Sept. 19-20, the Central Zone meeting will be held at Morton House, Grand Rapids.

• • •

American Bridge develops light steel joist

A lightweight, strong, structural steel member for supporting floors and roofs has been developed by U. S. Steel's American Bridge Div., Ambridge, Pa. Known as the "AmBridge Standard Steel Joist" it is being produced on an assembly-line basis. Since the joist is resistance welded, it is expected to replace generally-used joists which are hand-welded.

GE opens apparatus service in New Orleans

A new apparatus service shop has been opened in New Orleans by General Electric Co., Schenectady, N. Y. The shop, located at 2809 N. Robertson St., is the 45th service shop operated by the firm's service shops department, a part of the Apparatus Sales Division. The shop is equipped to repair and maintain motors, transformers, etc.

* * *

Report on titanium's annealing behavior

An evaluation of titanium's annealing behavior, with respect to critical deformation, is contained in a research report for the Army Ordinance Corps recently released by the Office of Technical Services, U. S. Department of Commerce, Washington, D. C.

Extensive fabrication of titanium and its alloys is expected in the future by cold-forming methods such as rolling, deep drawing, stretch forming and wire drawing.

* * *

Baldwin-Lima to study nuclear locomotive

Baldwin-Lima-Hamilton Corp., Philadelphia, and the Denver and Rio Grande Railroad, Denver, recently signed an agreement with the U. S. Atomic Energy Commission, Washington, D. C., for study of a nuclear-powered locomotive.

The companies will investigate engineering, technical and economic aspects of construction of a nuclear-powered engine, and make recommendations concerning potential applications of a unit of this type.

* * *

Compressed air power film now available

A new 16mm, 17-minute sound and color motion picture, "Compressed Air Power", is available from the Compressed Air & Gas Institute, 1410 Terminal Tower, Cleveland, at a cost of 60 cents per projection print.

The film uses animation to explain compression principles of different types of compressors, including operating principles involved in various applications of compressed-air power.

* * *

Wheelabrator Detroit office changes address

The Detroit district sales office of Wheelabrator Corp., Mishawaka, Ind., has moved to 13504 Fenkell Ave.

PHOSON and SILBOND *Brazed Joints Are Always*

Permanently United SINCE 1865

Here's Why:

No stress cracking under vibration, no pits or voids, complete penetration, liquid and gas pressure-tight . . . all these qualities are yours with fast, economical brazing at extremely low temperatures . . . with superior PHOSON and SILBOND performance!

Low temperature brazing makes joints with strength equal, or greater than the strength of the metals joined . . . not possible with soft solders. There are no extra finishing costs, no stresses resulting from high temperatures in base metals, common in high temperature or welding methods. There is no threading as in joining by fasteners, with attendant loss of strength.

Plus these important considerations, add the high electrical and thermal conductivity of Phoson and SilBond brazed joints, their excellent resistance to corrosion and the mass production methods to which these alloys lend themselves. You'll decide, as so many others have, to BRAZE . . . with PHOSON and SILBOND. Ask For PHOSON-SILBOND Booklet.

UNITED WIRE & SUPPLY CORPORATION
Brazing Alloy Division • Providence 7, R. I.
Offices in Principal Cities • Coast-to-Coast

Visit us in Booth No. 633 ninth exposition of the Air Conditioning and Refrigeration Industry

UNITED *LOW TEMPERATURE* BRAZING ALLOYS

sellstrom
safeguards
designed for comfort

RUBBER FRAME GOGGLES FOR CHEMICAL FUMES AND TOXIC DUST

Here are two rubber frame goggles. The No. 30385 is especially adapted for complete eye protection against all forms of chemical fumes and toxic dust. It is a favorite for dusting crops and underwater work. The No. 30386, shown above, can be used for practically every type of work involving eye hazards. Both have the following special features:

1. Frame is of high quality, soft pliable rubber for utmost comfort and wraps around the face.
2. 50 x 60 m/m removable lenses: your choice of shatterproof laminated or Flat Hardened. Lens snaps into grooved rubber.
3. Jumbo size. Large enough to accommodate personal prescription glasses.
4. Rubber head band has snap-on glove fasteners.
5. Offered in two styles:
   30385—Without vents. Waterproof. Clear glass lenses.
   30386—With screen vents. 50 x 60 m/m lenses, clear glass.
   See catalog No. 32 for complete description and available lenses.

Many industrial workers prefer these rubber goggles because they are compact, easily carried in the pocket.

If your dealer does not have these goggles in stock, he can order them for you. Or if you prefer, you can write us direct, either ordering a few pair for test purposes or requesting additional information.

sellstrom
MANUFACTURING COMPANY
Eye and Face Safeguards
Designed for Utmost Comfort
226 Hicks Road Palatine, Illinois

Atomic submarine launched by General Dynamics

An estimated 25,000 spectators watched the recent launching of the nuclear-powered submarine, *Seawolf*, at the Electric Boat Division shipyard at Groton, Conn. The *Seawolf*, second of the U. S. Navy's atomic submarines, will be used to evaluate the relative merits of a different type of propulsion plant from that in the *USS Nautilus*, the first such craft.

The *Seawolf* reactor is termed an intermediate reactor and is cooled by liquid sodium. The *Nautilus*, launched in January, 1954, has a reactor called "thermal," and is cooled by high pressure water.

A keel has been laid for a third nuclear submarine, and Congress has approved construction of four more. Results obtained from observation of operation of atomic-powered vessels will add to growing knowledge of new types of nuclear propulsion. As in earlier subs, welding plays an important part in construction of these newer-type underwater craft.

* * *

Thompson Products acquires Karl-Douglas Associates

Thompson Products, Inc., Cleveland, a manufacturer of aircraft, electronic and automotive parts, recently purchased Karl-Douglas Associates, Inc., Hawthorne, Calif. Karl-Douglas designs and manufactures hydraulic and pneumatic cylinders and valves. It will retain its identity, and plant location at Hawthorne, operating as a division of Thompson.

* * *

Film on dye penetrant inspection is available

"Flaw Location with Dye Penetrants" is a color, sound, 16mm motion picture currently available on a free loan basis from Turco Products, Inc., 6135 S. Central Ave., Los Angeles.

The film, running for 23 minutes, demonstrates every aspect of dye-penetrant inspection from laboratory theory to production-line techniques.

POSITIVE LOCK!

JUST LIKE THE
cam-lok
CABLE CONNECTORS

- Exclusive Cam-Action!
- Locks Tight!
- Stays Tight!
- No Spring Action!
- Releases Easily!

Exclusive Cam-Lok design guarantees positive, vibration-proof connection. Locks tightly in about ½ turn. No spring tension, no weaving or moving of contact surfaces, therefore, no arcing, burning, or freezing.

COMPARE POSITIVE LOCK and these CAM-LOK features with your present connectors:

1. High Pressure contact eliminates overheating and current losses.
2. Connects instantly, all cables from #2 to 4/0 without adaptors and without tools.
3. Self-compensating for wear, self-cleaning.
4. Fiber insulation pin, arcing impossible.

"QUICK-DISCONNECT" ELECTRODE HOLDERS
Obsolete all others!

Eliminate need for whips and whip end!

CHECK THESE FEATURES:

- Eliminates need for carrying whips.
- Holder plugs in quickly and easily to any cable merely by attaching holder handle to cable end.
- Less money tied up in cables.
- No electrician and no tools required to change holders.
- Holder and jaws insulated with tough, heat-resistant fibre glass.
- High pressure positive lock.
- Offset jaws eliminate rod bending.
- Offset holder permits burning rods to shorter stubs.
- Choice of offset or straight jaws.

Send TODAY for Bulletin No. 121

Write for FREE Literature Today!

cam-lok
DIVISION OF EMPIRE PRODUCTS, INC.
P. O. BOX Z-98, CINCINNATI 36, OHIO

Machine Tool Distributors' meet in Chicago

The 31st annual meeting of the American Machine Tool Distributors' Association, was scheduled to meet at the Sheraton-Blackstone Hotel, Chicago, Monday, Sept. 5.

* * *

RW Manufacturers' association reports order increase

The Resistance Welder Manufacturers' Association, Philadelphia, has announced that orders reported by members for the first six months of 1955 were 31% ahead of the first half of 1954. Shipments for the same period are 22% ahead of shipments during the first six months of last year.

* * *

Liquid Carbonic sells English interest

The Liquid Carbonic Corp., Chicago, recently announced sale of controlling interest in its English subsidiary, The Liquid Carbonic Co., Ltd., to the George J. Meyer Mfg. Co., Cudahy, Wis., producers of bottling equipment. Liquid Carbonic plans to establish a new English subsidiary for compressed-gas production.

* * *

Union Carbide receives safety award

Union Carbide & Carbon Corp., New York City, has received the National Safety Council's Award of Honor on the basis of its 1954 safety record. This is the 2nd consecutive year the firm has received this award. The award is given for a reduction of frequency and severity accident rates below par rates set by the Council.

* * *

Penn Salt has new Philadelphia address

Effective July 1, Pennsylvania Salt Mfg. Co. moved into its new quarters at Three Penn Center Plaza, Philadelphia. The firm was formerly at 1000 Widener Bldg., Philadelphia.

JUST IN CASE

To prevent misunderstanding, WELDING ENGINEER wishes to point out that the plug-type line valves pictured in our "On the job" feature in the August, 1955, issue receive no ordinary chromium plating application. The plug valves are spray welded with "Colmonoy No. 4," a patented chromium-boron-nickel powder alloy which gives a fusion-bonded, non-porous overlay.

Weldit

THE WORLD'S FINEST SALAMANDER USED the WORLD OVER!

The Weldit L-P "Heaterama" Salamander, Model #800, is designed to give maximum high heat output at low cost. The famous "Flame Dome" gives 360 degree distribution of quick clean heat. Tank Top Model #1850 also available.

Weldit INC. SINCE 1918

990 OAKMAN BLVD. DETROIT 38, MICHIGAN

40 YEARS with WELDING

Welding has changed the world's concept of metal joining during these past 40 years.

All the milestones of this great achievement will be depicted in WELDING ENGINEER's big 40th Anniversary Issue, which will commemorate the four decades that it has served the industry.

Closing date: Dec. 5.

Contact your local representative or write

WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill.

IT WELDS LIKE A CHARM

Send for FREE CATALOG

*TWECO-LITE, the new flexible ALUMINUM welding cable that weighs half as much, lasts longer, and costs less

a product of TWECO PRODUCTS CO. Wichita 1, Kansas

THE MOST ADVANCED
AUTOMATIC FLUXING SYSTEM
EVER OFFERED
FOR BRAZING

EASY WAY TO LOW COST

● All-State "Jet Flux" Auto-Dispenser No. 1 as you get it from the factory . . . is a pressure cylinder complete with automatic dispenser, controls, and hose with connections . . . ready to tie in, without special tools, to single or multiple brazing stations.

● Only one supply item — All-State "Jet Flux"—fluxes brazing work automatically through the fuel gas.

Ask to see "Jet Flux" Demonstrated by your Distributor
Folder "Way to Lower Brazing Cost" on request.

A-S DISTRIBUTORS
EVERYWHERE

All-State

ALL-STATE
WELDING ALLOYS CO., INC.
White Plains, N. Y.

COMING EVENTS

SEPT. 12-13: Annual Canadian Section Meeting, Seignory Club, Montebello, P.Q., Canada.

SEPT. 15-16: Eastern Zone Meeting, National Welding Supply Association, Sheraton-Mt. Royal Hotel, Montreal, Canada.

SEPT. 19-20: Central Zone Meeting, NWSA, Morton House, Grand Rapids, Mich.

OCT. 17-21: National Fall Technical Meeting, American Welding Society, Bellevue-Stratford Hotel, Philadelphia.

OCT. 17-21: Thirty-seventh Annual National Metal Exposition and Congress, Convention Halls, Philadelphia.

National Safety Congress, Chicago.

OCT. 18: NWSA Luncheon Meeting (Metal Show), Bellevue-Stratford Hotel, Philadelphia.

OCT. 31-NOV. 1: West Central Zone Meeting, NWSA, Hotel Phillips, Kansas City, Mo.

NOV. 3-4: Western Zone Meeting, NWSA, Ambassador Hotel, Los Angeles.

DEC. 5-6: Southeastern Zone Meeting, NWSA, The Dinkler Plaza, Atlanta, Ga.

DEC. 8-9: Southwestern Zone Meeting, NWSA, Shamrock Hotel, Houston.

JAN. 1: Fortieth Anniversary of WELDING ENGINEER.

FEBRUARY (Dates to be announced): Welding Conference, University of Wisconsin, Madison.

FEB. 1-2: Second Annual Midwest Welding Conference, Armour Research Foundation of Illinois Institute of Technology, Chicago.

MARCH 12-14: Fifty-sixth Annual Convention, International Acetylene Association, Hotel Statler, Los Angeles.

MARCH 19-22: Twelfth Annual Convention, National Welding Supply Association, Hotel Roosevelt, New Orleans.

MAY 8-11: Thirty-seventh Annual Meeting, American Welding Society, Hotel Statler, Buffalo.

MAY 9-11: Fourth Annual Welding Show, Memorial Auditorium, Buffalo.

Distributor appointments

Adamas Carbide Corp., Kenilworth, N. J.: Hartwell & Co., Houston.

Ampco Metal, Inc., Milwaukee: Distributors for mill-foundry lines are Kencroft Associates, Inc., Buffalo, N. Y., and Ontarion Metal Supply, Inc., Rochester, N. Y.

Carboloy Dept., General Electric Co., Detroit: Industrial Equipment Co., Joplin, Mo.

Edward Valves, Inc., East Chicago, Ind.: W. E. Bowler Co., Philadelphia, eastern representative has been assigned territory including Scranton, Pa.

TORIT
UNITIZED
DUST
CONTROL
eliminates dust at its source!

TORIT
UNITIZED
DUST CONTROL means each machine has its own custom-tailored dust collector designed to work specifically for *that* machine. There is no guess work, or average suction. Furthermore, dust control is provided only when that machine is running . . . there is no waste of power such as you have with centralized control when only a few machines are operating. This means better dust control at lesser operating cost and less initial installation cost. Get the facts now on how Torit will work better to . . .
"CLEAR THE AIR".

See our catalog in Sweet's Machine Tool File, or write:

TORIT
MANUFACTURING CO.
270 WALNUT STREET
ST. PAUL 2, MINNESOTA

Kenneth R. Herman was recently elected president of Vickers, Inc., Detroit. He was formerly vice-president and general manager. *Harry F. Vickers*, the firm's founder, has been appointed vice-chairman of the board. *Dr. N. E. Edlefson* was elected vice-president, engineering.

• • •

Ronald L. Loup has been appointed director of the development engineering division of Progressive Welder Sales Co., Detroit. Mr. Loup will be responsible for the company's development program which is expected to produce new types of resistance welding equipment and new applications.

• • •

Edward L. Dreyer was recently named president by the board of directors of Adamas Carbide Corp., Kenilworth, N. J. Mr. Dreyer has been executive vice-president and general manager for the past 9 years.

• • •

Electro Refractories & Abrasives Corp., Buffalo, N. Y., has created three new district manager positions in its grinding wheel division. *Carryl A. Asher*, vice-president, has been appointed eastern sales manager; *A. D. Stover*, district manager for the Detroit area; *John Hume, Jr.*, district manager for the Chicago area.

• • •

Karl K. Hilgendorf has been named advertising manager of Cleaver-Brooks Co., Milwaukee. Mr. Hilgendorf will be responsible for planning and directing advertising for the firm's four divisions.

• • •

Oliver A. Gottschalk, formerly assistant to the president, has been elected treasurer-controller of The Carborundum Co., Niagara Falls, N. Y. *George J. Zimmerman*, formerly staff assistant for management controls, was named assistant to the president.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

FOR WELDING AND CUTTING...

IN THE RED DRUM

HIGHEST QUALITY

DUST-FREE

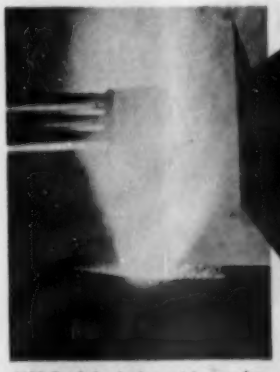
NATIONAL CARBIDE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company

GENERAL OFFICES: 60 EAST 42ND STREET, NEW YORK 17, N. Y.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED



M38 Torch beginning cut in wooden "two-by-four". Note how intense heat envelopes head of torch.

Note unchanged condition of torch head after "two-by-four" has been penetrated.

This test proves that

K-G TORCHES

have "what it takes"!

Cutting through a wooden "two-by-four" is a tough test for any torch. Yet, as shown in the two photographs, our M38 Torch came through with flying colors.

Wood, unlike metal, conducts heat very slowly away from the cut. The concentrated heat reflects backward over the head of the torch. The Monel head of the M38 Torch resists distortion from this intense heat and the gas passageways remain operative.

It will be found even after such an extreme test as this that the M38 head will still take a new cutting tip. NO DISTORTION HAS OCCURRED.

If you want the best in cutting and welding torches call your K-G Distributor, or send for 24-page catalog.

The K-G Equipment Co. (Inc.)

Dept. A 1744 Lehigh St., Allentown, Pa.

UNRETOUCHED

...the "daddy" of them all!

BUCKET TOOTH REPOINTED WITH

MANGANAL

Trade Mark Reg. U. S. Pat. Off.

11%-13½% MANGANESE-NICKEL STEEL

WEDGE BARS

21 Times

. . . at about 1/3 the cost of a new tooth each time!

A Messabi Iron Range open pit mine has found the way to keep its bucket teeth working longer.

The tooth illustrated has just been repointed for the 21st time: Seaco Hard-Surfacing Electrodes protect tip of wedge bar while workhardening. Manganal Wedge Bar was attached with Manganal Bare Electrodes for greater strength.

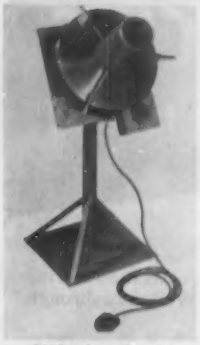
Next time your bucket teeth need repointing, try Manganal Wedge Bars and Electrodes, and Seaco Hard-Surfacing Electrodes.

STULZ-SICKLES CO.

SOLE PRODUCERS 92 N. J. RAILROAD AVE. NEWARK, N. J.

NEAREST DISTRIBUTOR UPON REQUEST

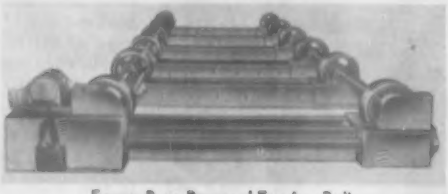
Positioning produces STRONGER, CLEANER, BETTER WELDS in less time by eliminating HANDLING



Light-duty Bench

Precision Gear-driven Positioners

Powered Turning Rolls and Idlers



Frame Base Powered Turning Rolls

Specializing in Custom Equipment

Write for Catalogue No. 548

UNIQUE TURN-TABLE & EQUIPMENT CORPORATION

122 SUMPTER STREET BROOKLYN 33, N. Y.

Clyde B. Clason, former managing editor of WELDING ENGINEER, is now director of public relations for Adams Associates, Inc., York, Pa. Mr. Clason has been in business journalism for many years, and is the author of numerous mystery novels.

* * *

Frederick C. Kroft was recently named general superintendent of manufacturing for Haynes Stellite Co., div. Union Carbide & Carbon Corp., New York City. Mr. Kroft joined the company in 1936. In 1950 he became superintendent of the inspection, process, and quality control department. Mr. Kroft is a member of the American Welding Society.

* * *

David Swan has been appointed director of research of Metals Research Laboratories, Electro Metallurgical Co., a division of Union Carbide and Carbon Corp., New York City. Mr. Swan has been assistant director of research for the Laboratories. He will continue to be located at Niagara Falls, N. Y. Mr. Swan has done research in the metallurgy and techniques of welding and cutting, with special studies of the production and uses of ferro-alloys and metals used in steel and cast iron. He is a member of the American Welding Society and the American Society for Metals.

* * *

L. E. ("Gillie") Gillihan has joined the staff of Welding Equipment Co., Oklahoma City (Harris and Hobart distributors). Mr. Gillihan has years of experience in cost accounting and the applications of welding products. His first assignment will be a complete cost-accounting study of all operations. His time will then be spent in store management.

* * *

Garth M. McLeod, formerly news editor for *Design News*, has joined the public relations branch of The Carborundum Co., Niagara Falls, N. Y.

* * *

Norbert K. Koebel has been appointed manager of the Heat Treating Furnace Div., Lindberg Engineering Co., Chicago. Mr. Koebel will direct research and development as well as supervising technical sales and application engineering.

Orville T. Barnett has been named assistant manager of the metals research department at Armour Research Foundation, Illinois Institute of Technology, Chicago. Mr. Barnett will help develop projects for new areas of research. A 1933 graduate of Illinois Tech., Mr. Barnett joined the Foundation in 1954 as supervisor of welding research in the metals research department. He had been regional sales manager of A. O. Smith Corp., Chicago. An expert in welding and metallurgy, Mr. Barnett has written many articles. He has been a contributor to WELDING ENGINEER, most recently with his current series on "Filler metals for joining." He is a member of the American Welding Society and the American Society for Metals.

* * *

Melvin O. Monsler, general manager of the welding equipment division, Harnischfeger Corp., Milwaukee, has been appointed a member of the company's executive committee. Mr. Monsler became general manager of the division in 1953.

* * *

S. W. Boone was recently appointed manager of public relations for the Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa. Mr. Boone previously was staff assistant to the works manager at the company's Beaver Falls, Pa., plant. He will be responsible for public relations for the division's plants in Beaver Falls, Alliance, Ohio, and Milwaukee. He will headquarter at Beaver Falls.

* * *

James W. Volk was recently named sales manager, Steel Fabricating Div., Michiana Products Corp., Michigan City, Ind. Mr. Volk has served in the sales department of the division since 1949. The firm makes heavy weldments, fuel tanks, and heat and corrosion-resistant castings.

* * *

Collin H. Alexander was recently promoted to manager of research and development of the vapor coating group, reflective products division of Minnesota Mining & Mfg. Co., St. Paul, Minn. This group manufactures coated abrasives, adhesives and coatings, electrical insulating materials, plastics and related products.

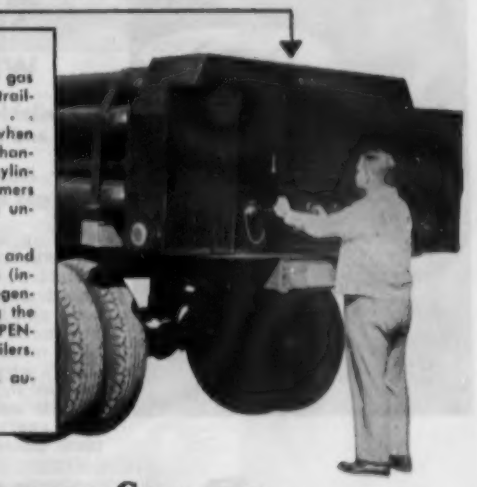
REDUCE CYLINDER HANDLING

Up to 50% with INDEPENDENT Gas Supply Trailers!

Here's the newest idea in gas service! Leave a full gas trailer with your customer . . . replace it with another when empty. Reduces cylinder handling up to 50%... cuts cylinder costs . . . gives customers the convenience of having uninterrupted gas supply.

Many gas manufacturers and haulers of compressed gas (including many government agencies), are already enjoying the many advantages of INDEPENDENT Gas Supply Trailers.

Available for all gases as authorized by ICC.



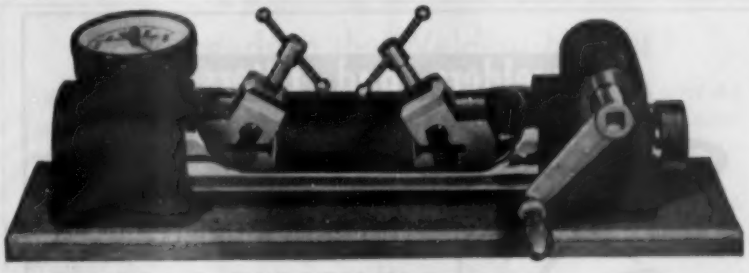
INDEPENDENT ENGINEERING COMPANY, Inc.

CONSULTING · DESIGNING · RESEARCH

Manufacturers of CYLINDERS AND GAS PRODUCING EQUIPMENT ACETYLENE · OXYGEN · HYDROGEN · NITROGEN

O'FALLON 5, ILLINOIS

We Invite Your Inquiries



For shop or field—a new

Portable Tensile Tester

Use this compact, precision tensile tester to test strip steel, wire, bolts, spot welds, or anything else within its 4,000 lb. capacity. Besides its use for inspection work in the shop, this portable device provides a convincing method of demonstrating the tensile strength of various materials in sales demonstrations and trade shows.

Only a moderate pull on the crank is sufficient to apply the maximum load. Results are easily read from the load gauge. Simple to use, anywhere, any time. Write for catalog sheet and price.

DETROIT TESTING MACHINE COMPANY

9380 Grinnell Avenue, Detroit 13, Michigan

FOR QUALITY WELDMENTS
USE
Drawalloy
CORPORATION

QUALITY CONTROLLED
STAINLESS STEEL
WELDING WIRE

- available in Spools, Coils and Lengths
- for Automatic and Semi-Automatic gas and inert arc welding

Welding wire by Drawalloy is made to an exacting high standard . . . a high standard established by long-experienced welding men who know welding wire and how it must work. Set-ups for automatic and semi-automatic welding take more time than regular welding. That's why you want to be sure of satisfaction *before* you start. This *reliable* wire is weld-tested to give the best results every time. Write today for complete information and prices.

Drawalloy
CORPORATION
LINCOLN HIGHWAY AT ALLOY STREET • YORK 12, PENNSYLVANIA

welders and fitters
Lee's RAPAROUND
Handy TOOL FOR
PIPE FITTERS & WELDERS
TOUGH
★ 45° ANGLE CHART ★ PROTRACTOR
★ SCALE
FLEXIBLE
approx. 4" x 60" "Little Helper" complete with spring steel holder. $2.75
★ CONSTANTS TABLE ★ DECIMAL EQUIVALENTS

LEE'S COMBINATION PATTERN SETS
A SET FOR FABRICATING PIPE FROM 2" TO 20" INCLUDING 180°
★ FREE CHART for making accurate 6" to 8" and 24" & compounds 6" to 12"
Pattern set $3.

ALSO AVAILABLE A PLAIN RAPAROUND 4"x60"
AND THE "BIG INCH" PLAIN RAPAROUND APPROX. 6"x60"
OBTAINABLE FROM YOUR DEALER
OR POST PAID FROM R. E. LEE
369 JUNIPERO AVE. - LONG BEACH 14, CAL.

Bruce D. Henderson, vice-president of Westinghouse Electric Corp., Pittsburgh, has been appointed to the apparatus products staff. *A. M. Kennedy, Jr.*, has been appointed general manager, purchases and traffic, succeeding Mr. Henderson. *D. R. Tashjian* was named manager of engineering for the electronics division, Baltimore, Md. Mr. Tashjian was manager of the division's government engineering department.

• • •

James L. Oberg has joined Metal & Thermit Corp., New York City, as a technical advisor. Mr. Oberg will handle special assignments on metals and welding processes. He will also investigate new markets and products. His headquarters will be in New York City. *George C. Betz* has been appointed manager of sales, Chemical & Metals Dept. He will manage sales activities for the company's industrial chemicals and plating materials, ceramic products and metals and alloys. *William C. Cuntz* has been named assistant manager of sales, Welding Dept. He will assist in sales of welding materials and equipment.

• • •

Homer R. Brown has been appointed to the newly created post of sales manager of the Milwaukee steel service plant of Joseph T. Ryerson & Son, Inc., Chicago. He has represented the company in the Milwaukee area since joining the firm in 1930.

• • •

E. Weldon Schumacher has been elected president of the American Optical Co., Southbridge, Mass. He replaces *Walter A. Stewart* who retired.

NO NAME . . . . . NO LITERATURE

Each month, in our Welding Info-Aids department, we advise subscribers requesting literature and catalogs to state in full their names and addresses. During the past week we have received several incomplete reply cards, including two from Johannesburg, South Africa.

WELDING ENGINEER is happy to be of service in providing its readers with Info-Aid material, but incomplete cards simply cannot be processed! Remember to give *all* the information requested on the card you send in.

John C. Ardagh has been appointed assistant sales manager for the Johnson Welding Equipment Co., Inc., Chicago. Mr. Ardagh has spent over 25 years in welding sales and engineering activities with the Lincoln Electric Co. in the Chicago and Cleveland areas. In his new position, Mr. Ardagh will supervise the activities of eight salesmen serving the Chicago area.

* * *

A. R. Schneller was recently named Eastern regional sales manager for the Welding Products Div., A. O. Smith Corp., Milwaukee. His headquarters will be in Leola, Pa., site of the firm's eastern electrode plant. Mr. Schneller, formerly Pacific Coast sales manager for the division, at Oakland, Calif., succeeds *Frank Gramm* who has resigned to enter another business.

* * *

C. Roger Sutton, has joined the Development & Research Div., The International Nickel Co., Inc., New York City, as a member of the Stainless Steel & Heat Resistant Alloys Section. He has been senior metallurgist at Argonne National Laboratory, Lemont, Ill., for the past five years. Mr. Sutton is a member of the American Welding Society and American Society for Metals.

* * *

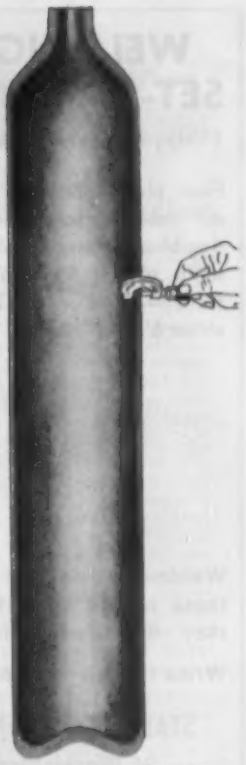
Died . . .

Lawrence E. Kunkler, president of Metallizing Co. of America, with plants in New York City and Chicago, died of a heart attack in New York City on August 1. He was 54. Mr. Kunkler established the Metallizing Co. of America 25 years ago. He developed the first metallizing gun for handling large wire and adapted the process of metallizing to American production speeds. As a pioneer of the metallizing industry he was often a guest speaker before the American Welding Society. He had recently been making his home in Scottsdale, Ariz., where he was president of Scottsdale Desert Estates.

* * *

Kenneth H. (Kenny) Jackson of Washington, Ill., 42, died suddenly Aug. 13. Mr. Jackson, for the past two years, has represented Westinghouse Electric Corp. as a sales engineer in central Illinois and eastern Iowa. Prior to joining Westinghouse, he served for nearly 20 years in various welding capacities with Caterpillar Tractor Co. at Peoria and Joliet, Ill. He is survived by his widow and two children.

How light should a gas cylinder be?



HARRISBURG Cylinders are made with an eye to the future and their ability to pass successive quinquennial tests.

They are as light as is consistent with *well-balanced design and construction.* Their most important characteristic is their unequalled uniformity of wall thickness. This unusual regularity effects an even distribution of strength throughout. There is not a weak point in a HARRISBURG Cylinder, no spot too thin or too thick.

For the sake of safety and long service life, buy HARRISBURG Gas Cylinders.

More than a century in Harrisburg

Harrisburg Steel CORPORATION HARRISBURG PENNSYLVANIA

Due to uniformity of wall thickness there is no excess weight in a HARRISBURG Cylinder.

Sales Leads in the Welding Market?

WELDING ENGINEER had developed more than 25,000 such leads since the first of the year. It is your best weapon for hitting the target . . . top editorial quality; ABC-audited paid circulation; worldwide readership; readers with buying power!

These are just a few of the reasons why YOU should use WELDING ENGINEER as your sales messenger.

Write or phone

WELDING ENGINEER

12 E. Grand Ave. - Chicago 11, Ill. - DElaware 7-0339

Like a magic carpet for overhead welding

Send for FREE CATALOG

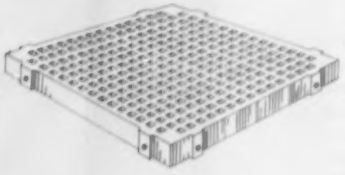
*TWECO-LITE, the new flexible ALUMINUM welding cable that weighs half as much, costs less and lasts longer.

a product of TWECO PRODUCTS CO. Wichita 1, Kansas

WELDING and SET-UP PLATENS

(Shipyard bending block type)

Floor plates—bending tables—lay-out tables—straightening tables—dog blocks—bending blocks—blacksmith blocks. 5'x5'—6'x6'—6'x8'—6'x10' — 5'x10' — 6'x12' — 3'x3' — either 6" or 7" thick.



Weldments dogged down to these planed semi-steel blocks stay flat during fabrication.

Write for low cost details.

STAHL EQUIPMENT CO.
94 Washington St.
Brookline Village 46, Mass.

Weld-O-Vent

"World's Finest Exhaust Systems"

Welding Fume Exhausters

MANY EXCLUSIVE FEATURES

High Velocity Hood Quickly Removes Smoke and Fumes.

- Portable and stationary units for all applications.
- Unlimited flexibility, fast, easy positioning, over 360° radius.
- Blowers can be attached to units or mounted at remote points connecting with ductwork.
- Units can be connected in series.

Available in 9, 12, or 16 feet reach units.

Write For New Application DATA . . .

Engwald Corporation
357 LAFAYETTE AVE.
BROOKLYN, N. Y.

30 YEARS AGO

(Taken from *The Welding Engineer* of September, 1925)

A special story describes the erection of Chicago's new 22-story Union League Club with a swimming pool of welded construction. The welding was done by Western Welding & Equipment Co., 1036 W. Lake St., Chicago.

—30 YEARS AGO—

Otto Adams has been named manager of Heylandt Sales Co., 140 S. Dearborn St., Chicago, American sales agent for the Heylandt oxygen plants in Berlin, Germany. Mr. Adams has been associated with the Heylandt factory in Berlin for the past ten years.

—30 YEARS AGO—

W. E. Shirra, L. C. Traeger and H. E. Brandell recently announced incorporation of General Welding & Boiler Co., 1615 Carroll Ave., Chicago. The firm will manufacture and deal in steel, iron and other metal products.

—30 YEARS AGO—

C. H. Hollup Corp., maker of welding wire and accessories, formerly International Welding Engineering Corp., is erecting a new building in Chicago. H. R. Pennington is president of the firm. K. R. Hare is sales manager for the western territory.

—30 YEARS AGO—

The Lincoln Electric Co., Cleveland, is cooperating with the Cleveland School of Technology in presenting practical training in electric arc welding this fall.

—30 YEARS AGO—

Acme Oxy-Acetylene Co., 108 S. La Salle St., Chicago, was recently incorporated by F. C. Wakins, J. E. Brenner and J. C. Spence. The firm will manufacture and sell hydrogen, oxyacetylene and other gases.

—30 YEARS AGO—

The Puyallup Steel & Welding Co., Puyallup, Wash., is planning to install additional equipment and enlarge its plant. This business is operated at 112 Stewart Ave. by William Wichemann and T. H. Eller.

—30 YEARS AGO—

W. A. Slack, president of Torchweld Equipment Co., who just returned from an extended trip through the southwest, states every indication is favorable for good business in the welding industry during the coming year.

Make More Money on EVERY Welding Job . .

METAL BOND
SOLDERING AND WELDING
PRODUCTS

We have been making Metal Bond Products for more than 25 years and successful Welders all over the country have been using them to advantage.

AIDS TO GOOD WELDING JOBS

- Tinning Compounds • Soldering Salts • Hard Metal • Aluminum Solder • Mouldough • Brazing Flux No. 10 • Special No. 31 • Seal-X-O • Cast Iron Welding Flux No. 4 • All Steel Wire Brushes and Holders.
- Make your own test—also send for our pocket-size catalog which contains information and descriptions of our money-saving METAL BOND Products.

METAL BOND MFG. CO.
MONTGOMERY CITY, MO.
P.O. BOX 215

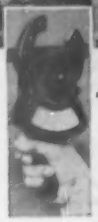
TILLMAN Gloves—Garments

WELDORS BUY FROM YOUR DEALER

ASK FOR OUR NEW CATALOG

BRAZILIAN DEERSKIN THE "STAY SOFT" LEATHER GLOVES AND MITTENS

TILLMAN PRODUCTS
John Tillman & Co.
Long Beach, Calif.



.....for Better Welding

USE THE
TONG TEST
AC-DC
AMMETER

Machine settings alone cannot control welding quality! Measure actual welding *current* instantly, accurately and safely by simply clamping a Tong Test Ammeter around the electrode cable. Only Columbia Tong Test measures both AC and DC. Interchangeable ranges available up to 1000 amperes.

Prevent costly defects—increase welding production—maintain valuable equipment—with low cost Tong Test Ammeter. Get the facts today!

Write for 8-Page Catalog WE-400

COLUMBIA

656-CE

COLUMBIA ELECTRIC MFG. CO.
4551 Hamilton Ave. Cleveland 14, Ohio

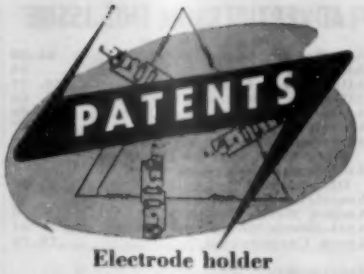
No. 89 The RIGHT FLUX for the JOB No. 20
No. 47 No. 18C

BACKED BY 60 YEARS OF PERFORMANCE

Whatever the particular job you have to do—we have the right FLUXINE you need. Besides our 25 FLUXINES we carry a complete line of "KOP-R-ARC" coated rods for welding copper and all copper alloys.

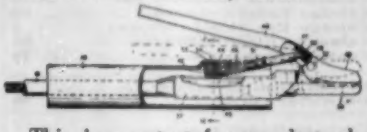
Write on company letterhead for chart and generous sample stating which FLUXINE desired.

KREMBS & COMPANY
(Est. 1875)
Dept. J, 669 W. Ohio St., Chicago 10, Ill.



Electrode holder

2,681,969. Donald J. Burke, Cleveland, Ohio. Assigned to Erico Products, Inc., Cleveland. Filed Dec. 26, 1950. Granted June 22, 1954.



This is a patent for an electrode holder. It is composed of a tubular handle of insulating material with a projecting member attached at one end. A detachable jaw is secured to the projecting portion with a clamp nearby for gripping an electrode.

* * *

Electrode holder

2,677,745. Edgar D. Leon, Detroit. Filed Sept. 15, 1951. Granted May 4, 1954.

An electrode holder is the subject of this patent. A hollow, non-conductive insulating housing is closed at one end. Within the housing is a pair of elongated conductive interfitted grips that are relatively movable. Both grips have outer housing engaging surfaces of same radius to form a cylinder when assembled. Provided is a means for securing one of the grips to the housing. A coiled spring between grips tends to effect longitudinal movement of the other grip. A manual means, which projects through the closed end of the housing and is joined to said movable grip, effects a longitudinal movement thereof against action of said spring. Housing and stationary grip have formed therein aligned transverse slots adapted to coöperatively receive a welding electrode. The movable grip has a transverse slot normally in non-alignment with said first slots and alignable therewith on application of the manual means to receive said electrode. The grips are formed with opposed slots and interdigitated fingers, limiting the relative longitudinal movements of grips and for retaining them in assembled relation independent of the housing. The grips have opposed central slotted portions of cylindrical shape and the same internal radius intermediate their ends, forming a cylindrical enclosure for the coiled spring.

GLENN COMPANY — Constant Voltage *News Notes*

CV Welding Speeds Water Heater Production

Four major U.S. water heater manufacturers now use GLENN CV automatic welders. Why? Because GLENN CV makes automatic welding *truly* automatic. Arc voltage stays constant—no voltage or feed control problems. Current can be increased for faster welding with fewer rejects. The result is far higher production at much lower cost.

GLENN CV welders are job-proved for submerged arc, inert gas, CO-2, "squirt" and automatic hard facing and stud welding processes. 3 models—500, 750 and 1200 amp. continuous duty rating, 18-42 v. arc voltage range. Operate from 3-phase a.c., deliver d.c. welding current at 85%-plus efficiency, 90% or better power factor. Write or wire for literature, application data, prices. 4

GLENN COMPANY
CONSTANT VOLTAGE PIONEERS
3134 E. 10TH STREET
OAKLAND 1, CALIF.
10228 SO. AVE. N.
CHICAGO 17, ILL.

"Red Head"
WELDING CLAMPS

• Designed for Welding •

No Threads To Damage

1. Case hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

CHICAGO BOILER COMPANY
1968 CLYBOURN AVENUE
CHICAGO 14, ILLINOIS

NO INJURIOUS FUMES . . .

ANTI-BORAX

No. 2 BRAZING FLUX

For Brass, Bronze, Copper, Steel, Malleable Iron, etc. Causes the bronze to penetrate deeper into the joint—making a stronger union than is possible with other fluxes. High efficiency makes it more economical to use. Melting point 300°.

ALSO

1—Cast Iron Welding Flux
3—Brass, Bronze Welding Flux
4—Flux for Bronze Welding Cast Iron
5—Extra Quality Aluminum Flux for Cast Aluminum Welding
7—Steel Flux
8—Aluminum Flux for Sheet Aluminum
9—Stainless Steel Flux
11—Tinning Compound
12—Burnt Cast Iron Welding Flux
13—Brazing Flux for Extruded Bronzes
14—Special Brazing Flux for Aluminum Bronze, Everdur, and all Silicon Bronzes
15—Special Flux for Magnesium Alloys, Dow Metal, etc.
16—Silver Solder Paste Flux

FOR THE BEST JOB AT LEAST COST

Weldors can save more money and get a better job on production work, making special tools, and repair work with the right Anti-Borax product—order by number. Send for free sample and descriptive circular.

ANTI-BORAX COMPOUND CO., INC.

FORT WAYNE, INDIANA

which weldor
has the
*TWECO-LITE?
*the new ALUMINUM welding cable that weighs half as much, lasts longer and costs less
A Product of
TWECO PRODUCTS COMPANY
Wichita 1, Kansas

ADVERTISERS IN THIS ISSUE

Air Reduction Sales Co. 58-59
Allen, L. B. 94
Alloy Rods Company 76, 77
All-State Welding Alloys Co., Inc. 86
Aluminum Co. of America 62-63
American Brass Co. 57
American Chain & Cable Co., Page Steel & Wire Div. 12
American Manganese Steel Division 60
American Optical Company 42
Ampco Metal, Inc. 8
Anti-Borax Compound Co. 94
Arcos Corporation 78-79

Belden Mfg. Company ..... Inside Front Cover
Bridgeport Brass Company 87
Burdett Oxygen Co. 46

Cam-Lok, Div. of Empire Prods. 84
Carborundum Company, The 38-39
Chicago Boiler Company 93
Chicago Eye Shield Company 2
Columbia Electric Mfg. Co. 93
Contour Marker Corp. 70

Detroit Testing Machine Co. 89
Drawalloy Corp. 90

Eastman Kodak Company, X-Ray Division 53
Engwald Corp. 92
Erico Products, Inc. 41
Eutectic Welding Alloys Corp. 50-51

Fibre Metal Products Co. 35

General Electric Company 10-11
Glenn Company 93
Goldsmith Bros. Smelting & Refining Co. 72

Harnischfeger Corp. 48
Harrisburg Steel Corp. 91
Harris Calorific Co., The 61
Haynes Stellite Co., Div. of Union Carbide & Carbon Corp. 75
Hobart Bros. Company 1

Independent Engineering Co., Inc. 89
International Nickel Co., Inc. 64
Invincible Vacuum Cleaner Mfg. Co. 71

Jackson Products 4

K-G Equip. Co. (Inc.) 87
Krembs & Co. 93
Lee, R. E. 90
Lincoln Electric Co., The 14
Linde Air Products Co., A Div. of Union Carbide & Carbon Corp. 67

Mallory & Co., Inc., P. R. 9
Metal Bond Mfg. Company 92
Metal & Thermit Corp. 73
Miller Electric Mfg. Co. 74

National Carbide Corp. 87
National Cylinder Gas Co. 45
National Welding Equip. Corp. 7
Norris-Thermador Corp. 68

Page Steel & Wire Division, American Chain & Cable Co. 12

Ruemelin Mfg. Co. 82

Sellstrom Mfg. Company 84
Smith Corp., A. O. ..... Back Cover, 54-55
Smith & Sons, G. W. 82
Stahl Equipment Company 92
Stulz-Sickles Company 88
Sylvania Electric Products ..... Inside Back Cover

Templi Corp. 80
Tillman Co., John 92
Titanium Alloy Mfg. Div. 81
Torit Mfg. Co. 86
Tweco Products 70, 74, 80, 85, 91, 94

Unifiex Cable Div., United Metal Craft Co. 40
Union Carbide & Carbon Corp., Haynes Stellite Company 75
Union Carbide & Carbon Corp., Linde Air Products Company 67
Unique Turn Table & Equip. Corp. 88
United Wire & Supply Corp. 83

Vickers Electric Div., Vickers, Inc. 12
Victor Equipment Co. 16

Wagner Mfg. Company ..... Front Cover
Weldit, Inc. 85
Weltronic Corp. 65
Westinghouse Electric Corp. 69
Worthington Corp. 43

WHERE TO BUY

6714 Bryn Mawr Ave.

THE WELDING SHOPPER

SCHOOL

WELDING—A profitable trade. Demand for trained men. Learn quickly at best equipped school in U.S. Non-profit. G. I. approved. Catalog free. Write Hobart Welding School, Box U-951, Troy, Ohio.

POSITION WANTED

ATTENTION SALES MANAGERS: Salesman and sales engineer open for sales position—Practical man with two years' technical training—23 years' experience in welding industry—Fully versed in oxyacetylene and electric welding—Also experienced in industrial sales, distributor setups and direct selling. Located in Chicago. Box 952, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill.

17 years in oxyacetylene and arc welding. Would like position selling and demonstrating welding equipment and accessories in New England. Experience: steel fabrication, structural, pipe lines, wrought iron, general repairs and production. Age 40, married. Answer Box 957, WELDING ENGINEER, 12 E. Grand Chicago 11, Ill.

HARD SURFACING SPECIALIST with 9 years experience servicing many different types of industries desires sales position. Complete resumé on request. Box 958, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill.

EQUIPMENT WANTED

NATIONAL SALES ORGANIZATION wants additional line of products and equipment to sell welding dealers and users. Reply Box 955, WELDING ENGINEER, 12 E. Grand, Chicago 11, Ill.

HELP WANTED

DISTRICT SALES MANAGER

Immediate opening for man to cover the states of Illinois, Indiana, Michigan, and Wisconsin. Extensive traveling required. Permanent position for man to contact distributors and consumers in assigned territory. Sales experience necessary, and prefer man with knowledge of the welding industry. Salary, commission, and travel expenses. If you are genuinely interested, tell us about yourself in your first letter. Factory interviews arranged. All applications and replies will be held in strict confidence. Address reply to:

TWECO PRODUCTS COMPANY
P. O. Box 666
Wichita 1, Kansas

CLASSIFIED ADVERTISING

THE WELDING SHOPPER

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

(Not available for equipment advertising)

90c a line, minimum 3 lines. To figure advance payment, count 5 average words as a line. INDIVIDUAL EMPLOYMENT WANTED advertising rate is ½ the above rates, payable in advance.

PROPOSALS, 90c a line an insertion.

INFORMATION

BOX NUMBERS count 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE

The advertising rate is $8.75 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. W.E.

HELP WANTED

MANUFACTURER'S REPRESENTATIVE to sell plate, bars, weldments, specialty items to Welding Supply and Contractor Equipment Dealers, Heavy Equipment Operators, Quarries, Mines, Industrial Maintenance Users. Excellent Commissions. Write in detail territory now covering. Reply Box 956, WELDING ENGINEER, 12 E. Grand, Chicago 11, Ill.

WELDING ENGINEER

Expanding programs in welding, brazing and soldering have created an opening for a welding research engineer. This is an opportunity for diversified experience in joining. Salary commensurate with experience and training. Liberal employee benefits include generous tuition refunds for graduate study. Write:

Mr. T. E. DePinto
ARMOUR RESEARCH FOUNDATION
of Illinois Institute of Technology
10 West 35th St.
Chicago 16, Illinois

WESTINGHOUSE ATOMIC POWER
has openings for:
METALLURGISTS
and
WELDING ENGINEERS

At high technical and supervisory levels

In quality control and inspection supervision of welding and metals fabrication. A degree in metallurgy and 3-15 year's experience on code welding and stainless or other control of metallurgical operations, metals fabrication or field inspection are required.

SALARY OPEN

Please send detailed resume, including past earnings to:

A. M. JOHNSTON
Westinghouse Electric Corp.
PO Box 1468
Pittsburgh 30, Pennsylvania
All replies held strictly confidential

BUSINESS OPPORTUNITIES

FOR SALE: Modern Equipped Welding and Radiator Repair Business. Same location 35 years. Owner retiring. Modern Welded Products Co., 306 W. Broadway, Alton, Ill.

BUSINESS OPPORTUNITIES

A NICE REPEAT BUSINESS
JOBBERS WANTED IN EVERY CITY TO SELL "WELDER'S PAL" EYE DROPS
On the market for 20 years
CARHOFF COMPANY
11706 Kinsman Rd., Cleveland 20, Ohio

EQUIPMENT FOR SALE

IN 100-LB. LOTS, F.O.B. SCRANTON
SALE OF SURPLUS ELECTRODES
AMPCO-TRODE, 3/16" x 14" No. 18 Aluminum Bronze Coated D.C. Electrodes in Good Condition—25 lb. Cartons—80c lb.
SCRANTON WELDING SUPPLY COMPANY
1301 Wyoming Ave. Scranton, Penna.

1—Size 10, 5¾ x 5 Used Model D-VB Sullivan Air Compressor, Class WL-60, Pressure 125 lbs. Maximum speed 870 RPM, good condition.
1—500 lb. Steam or Compressed Air Trip-hammer in good condition. Used.
MIKE'S WELDING SUPPLY CO.
P. O. Box 1373 Great Falls, Montana

CUTTING MACHINES, AIRCO Camo & Radiographs, Nat. B's Harris K's.
SEAM WELDER, Progressive, 150 KVA, New.
SPOT WELDER, National, 40 KVA, Used.
CUTTING TORCHES, Used, Oxweld, Airco, Harris.
WELDING TORCHES, New, Rego GV.
BRONZE—STAINLESS—AMPCOTRODES.
NO. 12 LENSES, ELECTRODE HOLDERS.
RALL SUPPLY CO. 51 E. 42nd St., N.Y.C. 17

BARGAIN SALE
SURPLUS ALUMINUM WIRE 36"
VARIOUS TYPES AND SIZES
WRITE FOR FREE PRICE LIST
Box No. 953, Welding Engineer
12 E. Grand Ave., Chicago 11, Illinois

New Surplus

50,000 lb P & H Welding Electrodes

Type 70LA-2 (E-7016)

in moisture-proof containers

Sizes 1/8, 5/32 and 3/16

Price:—

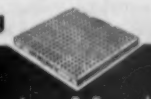
less than 1,000 lb quantities 9.5¢ per lb.
over 1,000 lb quantities 8¢ per lb.

RESURFACING WELDERS, INC.
2701 Michigan
Detroit 16, Michigan

REPLIES (Box No.): Address to office at 12 E. Grand Ave., Chicago 11, Ill.

EQUIPMENT FOR SALE

Welding Platens



Acorn Iron & Supply Co.
901 N. Delaware Ave. Phila. 23, Penna.

1—ACETYLENE PLANT COMPLETE
Generator—1500 lb carbide capacity
Norwalk Compressor
A-1 Condition

1—OXYGEN PLANT COMPLETE
Messer 40 meter column
Norwalk 4 stage 13¾" x 12" Compressor
Norwalk 10" x 8" Pump Compressor
Priced to Sell

AMERICAN COMPRESSED GAS PRODUCTS
5300 So. Hanna Ft. Wayne, Indiana

SAVE ON NEW WELDING SUPPLIES

AIRCO TORCHES
No. 822-9065 ..... $29.00

ARGON GAS SAVERS
V-30—16 x 21..... $12.00

SMITH WELDING TIPS
AW-20 thru AW-30..... $2.50 each

SMITH LC 209 CUTTING ASSEMBLY
90° head $19.00

• • •

Large Stock! Good Selection! STAINLESS—TUNGSTEN AND MILD STEEL WELDING ELECTRODES AT CLOSEOUT PRICES

Write for listing and lowest prices.

• • •

RESISTANCE WELDING TIPS
20,000 Assorted Tips, Holders, Wheels at low bargain prices.

Send us your requirements for immediate quotations.

Write, wire, phone for complete bulletins on bargain priced welding equipment.

TOOL DESIGN & EQUIPMENT CO.
Welding division
225 Lafayette St. • New York 12, N. Y.
CAnal 6-4753

free literature . . . . . USE CARD ON OPPOSITE PAGE

51. WET BLAST CLEANING—American Wheelabrator & Equipment Corp. 4-page paper, "Wet Blast Cleaning & Finishing News," (Vol. 1, No. 1) discusses the process of wet blasting and its applications.

52. ACETYLENE CYLINDERS—Norris-Thermador Corp. Illustrated brochure explains how acetylene cylinders and other compressed gas cylinders are manufactured.

53. TEMPERATURE CONTROL—Tempil Corp. Reprint, "Molding Temperature Control with Temperature Indicating Crayons," discusses temperature control in plastic molding with brief descriptions of typical plastic processes.

54. GENERATORS—D. W. Onan & Sons Inc. "Power Points Digest," Vol. 11, No. 1, is a 20-page booklet describing types of generators available for emergency use.

55. WELDING EQUIPMENT—Air Reduction Sales Co. 16-page catalog illustrates and describes "Aircomatic" welding equipment, including manual and automatic units along with accessory apparatus and welding wire.

56. ALUMINUM—Reynolds Metal Co. "Technical Advisor," No. 30, features some of the important uses of aluminum in composite metals, as well as latest developments in surface finishing of aluminum.

57. FLEXIBLE HOSE—The Flexaust Co. Complete set of illustrated bulletins (Nos. 40, 41, 42, 43, 44 and price lists) discuss design and installation of flexible hose used in dust and fume control.

58. PIPE THREADER—Lawco Inc. Folder describes the "Lawco Jr." portable pipe threader, including applications.

59. MIG WELDING—General Electric Co. 4-page folder, GEC-1334, discusses automatic Mig welding equipment including advantages, applications, and available types.

60. ELECTRODES—Rankin Mfg. Co. Form A6-1 is a reference chart giving specifications and instructions for use of hard-facing electrodes in tractor and shovel maintenance.

61. PYROMETER—Arklay S. Richards Co., Inc. Illustrated 15-page catalog gives complete information about available pyrometers, thermocouples and insulators.

62. X-RAY ANALYSIS—North American Philips Co., Inc. 8-page booklet, "Twenty Questions and Answers on X-ray Analysis," explains the difference in X-ray powder camera, diffractometer and spectrograph equipment and techniques.

63. CLAMPS—Wetzler Clamp Co. 4-page folder presents line of metal-working clamps designed for hard-to-get-at clamping surfaces.

64. METERS, RECORDERS—Fischer & Porter Co. 24-page catalog, No. 2, describes process-control instruments, giving complete specifications and illustrations of flow meters, pressure regulators, pneumatic recorders.

65. ELECTRODE GUIDE—Alloy Rods Co. 4-page folder is a guide for proper selection of stainless steel electrodes to meet varied requirements of corrosion, heat resistance and high strength.

66. ARC WELDING—National Cylinder Gas Co. Illustrated sheet discusses the new slag-gas shielded welding process for either automatic or semi-automatic application.

67. ACETYLENE TORCH—Velocity-Power Tool Co. Folder No. 1413-1 treats "Torch-o-matic" pistol-type, air-acetylene torch for soldering, brazing, pre-heating and sweating.

68. HELMETS, ELECTRODE HOLDERS—The Fibre-Metal Products Co. Booklet (Form 100) lists, in 16 illustrated pages, welding helmets, electrode holders, face shields and related products.

69. ABRASIVES—Bay State Abrasive Products Co. 25-page catalog describes and illustrates types of abrasive and grinding wheels, abrasive discs, with comparison and application charts.

70. POSITIONERS—Aronson Machine Co. Catalog B lists, in 38 pages, current types of welding positioners and turning rolls, plus their applications and specifications.

71. AUTOMATIC WELDING—The Reid-Avery Co., Inc. 4-page folder describes "Model BW-2" welding head for use in various types of automatic arc welding.

72. BRAZING—The American Platinum Works. Sheet gives step-by-step procedure for torch brazing with low-temperature, silver-brazing alloys.

73. STAINLESS STEEL WELDING—Crucible Steel Co. of America. "Preventing Carbide Precipitation on Welding Unstabilized Austenitic Stainless Steel" is a 4-page treatment of this problem, including recommended technique and solution.

74. TIG WELDING—The Liquid Carbonic Corp. 13-page manual, "Use of CO_2 in Tungsten Inert Gas Welding," is intended as a guide to proper usage of torch equipment when employing carbon-dioxide shielding.

75. FLASH BUTT WELDERS—Thomson Electric Welder Co. Bulletin 324 presents "F-4" series flash and butt welders for heavy-duty work.

76. SHAPE CUTTING—Linde Air Products Co. Automatic tracer is described in illustrated 4-page bulletin. Tracer can cut a wide variety of metal shapes.

77. ARC WELDING STUDS—KSM Products, Inc. Bulletin P-20 is a price list and specification sheet for standard arc welding stud line.

78. WELDING CONTROL—Robotron Corp. Bulletin 361 describes and illustrates control timer-ignitron contactor combinations for a variety of resistance welding applications.

79. WELDING CABLE—Uniflex Cable Div. Illustrated 4-page folder discusses construction, voltage-size requirements and available types of welding cable.

80. EQUIPMENT, SUPPLIES—The Burdett Oxygen Co. 84-page, 1955 catalog describes and illustrates equipment and supplies for gas and electric welding, including a section on industrial safety equipment.

81. ELECTRODES—Sylvania Electric Products Inc. Folder gives tips on proper usage of tungsten electrodes in a-c and d-c welding.

82. HEAT-TREATING DATA—Ajax Electric Co. "Tips and Trends" (Vol. 8, No. 3) contains bibliography and brief resumé of heat-treating articles. Also included is discussion of care of thermocouples.

83. CLEANING COMPOUND—Oakite Products, Inc. Folder describes uses of alkaline detergent said to be capable of removing rust, grease, phosphate coatings and oil.

84. RECTIFIERS—International Rectifier Corp. Bulletin GPR-1, listing ratings and specifications of germanium-power rectifiers, includes operating instructions and characteristic curves.

85. PIPE GAGE—Dayton Rogers Mfg. Co. A combination standard pipe and conduit gage is available upon request. It can calibrate sizes from ⅛ to 1¼ in.

86. BONDING—Rubber & Asbestos Corp. Illustrated 8-page manual, "Adhesive Bonding," discusses typical adhesive applications with suggested methods of proper adhesive selection.

87. ALUMINUM WELDING—The Taylor-Winfield Corp. "Weld-It" (No. 555) treats precision welding of aluminum.

88. STUD WELDING—Nelson Stud Welding Div. Engineering bulletin No. 50 contains latest data on models of "NS-9" stud-welding units and companion controls.

89. WELDING EQUIPMENT—Weldit Inc. Catalog No. 495 describes and illustrates available welding and cutting outfits, regulators, connections and safety accessories.

90. SAFETY SPECTACLES—Allied Safety Equipment, Inc. Lightweight "Feather-Specs" are distortion-free spectacles with extra large, impact-resisting, plastic lens for light duty jobs. Sheet describes them.

91. RADIOGRAPHY—Gamma Industries, Inc. Folder describes inspection by portable gamma ray machines stating advantages of such atomic-energy testing.

92. SEAMER—Cayuga Machine & Fabricating Co., Inc. Illustrated sheet details portable automatic seam welder.

93. PORTABLE WELDERS—Royal Arc Industries, Inc. Brochure describes and illustrates portable arc welders for maintenance and repair welding.

94. CORROSION CONTROL—American Zinc Institute. "How Zinc Controls Corrosion" is a 32-page illustrated booklet describing ways zinc lengthens life of steel products and aids in corrosion resistance.

95. ACID-RESISTANT CLOTHES—Resistall Work Clothes, Inc. Illustrated catalog presents a varied selection of industrial apparel made of Orlon and Dynel synthetic fabrics, including data on acid-resistant qualities of these items.

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and Bulletins shown on facing page, and for those featured in this month's ads as listed on next page

Also information about

NEW PRODUCTS described on pages 66 to 78

Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

USE POSTPAID CARD →

★ For copies of any manufacturers' bulletins described on page at left, circle the number of the items on card at right. Fill in your name, title, company and address. This has to be done only once on each post card. You need no postage.

★ For additional information on New Products described in this issue, circle the numbers of the items that interest you. The New Products section begins on page 66.

WARNING!

Illegible or incomplete addresses may keep you from receiving the information you desire. And remember, cards postmarked after the deadline date cannot be processed.

IMPORTANT

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL
- DO NOT USE RUBBER STAMP

Name_____ Title_____

Company_____

Address_____

City_____ State_____ 9/55

NOT GOOD AFTER DECEMBER 1, 1955

WELDING ENGINEER, 12 East Grand Ave., Chicago 11, Ill.

Please send me without obligation further information about the following:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 45854, Chicago, Ill.

Welding Info-Aids

Welding Engineer

12 East Grand Avenue

Chicago 11, Ill.

ad literature

101. Air Reduction Sales Co.—Sample of "Easyarc" iron powdered electrode.
102. Air Reduction Sales Co.—Iinformation on arc welding holders, d-c welders and helmets.
103. Alloy Rods Co.—Information on lime electrodes for high temperature and pressure services.
104. Alloy Rods Co.—Bulletin on iron powder low hydrogen electrode.
105. All-State Welding Alloys Co., Inc.—Folder, "Way to Lower Brazing Cost".
106. Aluminum Co. of America—176-page text, "Welding Alcoa Aluminum".
107. American Brass Co.—Booklet on welding rod selection for saving time and cutting costs.
108. Bridgeport Brass Co.—New booklet, "Bronze Welding Alloys".
111. Burdett Oxygen Co.—Information on "Beaver" portable cutting machine.
109. Cam-Lok, Div. of Empire Prods.—Bulletin No. 121 on cable connectors and electrode holders.
110. Carborundum Co.—Folder on "Carboflex" depressed center wheels.
112. Carborundum Co.—Booklet on "MX" abrasive products
113. Carborundum Co.—Brochure on "Port-A-Belt" grinding attachments.
114. Chicago Eye Shield Co.—Literature on all types of safety goggles.
115. Columbia Electric Mfg. Co.—Catalog WE-400 on a-c/d-c ammeter.
116. Contour Marker Corp.—Information on contour-marking devices.
117. Detroit Testing Machine Co.—Catalog sheet on portable tensile tester.
118. Drawalloy Corp.—Information and prices on stainless steel welding wire.
119. Engwald Corp.—Application data on welding fume exhausters.
120. Eutectic Welding Alloys Corp.—32-page guide for selecting welding rods and electrodes.
121. General Electric Co.—Bulletin GEC-1334 describes automatic welding system using CO_2.
122. Glenn Co.—Application data and prices on CV automatic welders.
123. Goldsmith Bros. Smelting & Refining Co.—Data book on low temperature silver brazing.
124. Harnischfeger Corp.—Bulletins on arc-welding equipment and electrodes.
125. Harris Calorific Co.—Folder No. 540710 describes oxyacetylene heating torch.
126. Haynes Stellite Co.—Booklet, "Hastelloy Alloy C—A Machineable Hard-Facing Alloy."
127. Hobart Bros. Co.—Complete information on various types of welders.
128. Independent Engineering Co.—Data on gas cylinder trailers.
129. International Nickel Co.—Folder, "Repair Cast Iron Parts Quickly and Easily".
130. Invincible Vacuum Cleaner Mfg. Co.—Folder describes flux recovery equipment.
131. K-G Equipment Co.—24-page catalog on cutting and welding torches.
132. Krembs & Co.—Fluxine chart and samples available.
133. Lincoln Electric Co.—Bulletin 1343 on combination a-c/d-c welder and iron-powder electrodes.
134. Linde Air Products Co.—Booklet F-8684 describes welding and heating torch.
135. P. R. Mallory & Co., Inc.—Information on electrode designs available in welding catalog.
136. Metal Bond Mfg. Co.—Pocket-size catalog contains information on soldering and welding products.
137. Metal & Thermit Corp.—Data on all types of arc and thermit welding products.
138. Miller Electric Mfg. Co., Inc.—Information on selenium-rectifier and other arc and spot welders.
139. National Cylinder Gas Co.—Broadside on portable flame-cutting machine.
140. National Welding Equip. Co.—Complete details in "Regulator" booklet.
141. Norris-Thermador Corp.—Specifications on acetylene cylinders.
142. Page Steel & Wire Div.—Folder DH-402 contains full analysis list of automatic welding wire.
158. Ruemelin Mfg. Co.—Fume collector bulletin No. 37E available.
143. Sellstrom Mfg. Co.—Information on rubber frame safety goggles.
144. A. O. Smith Corp.—Details on SW-85 and 15 electrodes and other welding products and services.
145. Stahl Equipment Co.—Details on welding and set-up platens.
146. Sylvania Electric Products, Inc.—Technical information on tungsten electrodes.
147. Tempil Corp.—Sample temperature pellets available.
148. Tillman Prod.—Catalog lists welding gloves and garments.
149. Torit Mfg. Co.—Catalog on unitized dust collectors.
150. Tweco Prods. Co.—Catalog on aluminum welding cable.
151. Unique Turn Table & Equip. Corp.—Catalog No. 54B on positioners, turning rolls and idlers.
152. United Wire & Supply Corp.—"Phoson-Silbond" booklet on low temperature brazing.
159. Vickers Electric Div.—Bulletin on magnetic amplifier rectifier d-c welder.
153. Weltronic Co.—Brochure on new welding control.
154. Weltronic Co.—Folder on inert-gas welding control.
155. Weltronic Co.—*Weltimer Magazine* available.
156. Westinghouse Electric Corp.—Information plus samples on "XL-610" electrodes.
157. Worthington Corp.—New bulletin R-1700-B15 tells how to use and buy positioning equipment.

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 45854, Chicago, Ill.

Welding Info-Aids,
Welding Engineer
12 East Grand Avenue
Chicago 11, Ill.

Name_____ Title_____
Company_____
Address_____
City_____ State_____ 9/55

NOT GOOD AFTER DECEMBER 1, 1955

WELDING ENGINEER, 12 East Grand Ave., Chicago 11, Ill.

Please send me without obligation further information about the following:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160

Inert Gas Welding?

Standardize on Sylvania Tungsten Electrodes for dependability, ease of handling, economy...

USE THE RIGHT ROD for the job *every* time, and you come out ahead three ways! You save time. You save electrodes. And you turn out better welds.

To help you fit the rod to the job, Sylvania makes three types of tungsten electrodes . . . to meet almost any condition encountered in atomic hydrogen, helium and argon arc welding. Each of these three top-quality electrodes is manufactured to exacting specifications to assure the uniform, stable arc you need for successful inert gas welding. Each is designed to give you the utmost in economy; minimum tungsten loss in the arc.

Sylvania Tungsten Electrodes are supplied with chemically cleaned, etched surface . . . the standard finish for most applications. Other finishes available include centerless ground.

Order Sylvania Tungsten Electrodes in handy packages of ten from your welding supplies distributor. For technical information write to:

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.
In Canada: Sylvania Electric (Canada) Ltd.
University Tower Bldg., Montreal

SYLVANIA

Lighting • Radio • Electronics • Television • Atomic Energy

"Strike if you will this old gray head--but spare these electrodes,"

the welder said!

After six months with A. O. Smith SW-15 welding electrodes, this welding supervisor wanted to check operator acceptance. "I told 'em I was thinking of switching to another brand. Man! It was like trying to pull teeth. They just wouldn't part with SW-15. And to be perfectly honest with you—*neither would I!*"

A. O. Smith electrodes win friends on every level

SW-15, FOR EXAMPLE — It's the universally favored "universal" electrode . . . the undisputed winner in Class E-6013 . . . perhaps the world's most-copied electrode.

Operators go for SW-15's easy handling . . . smooth arc, self-cleaning slag, lack of splatter and freedom from undercutting. They're proud of the good-looking welds they get.

And the men who pay the freight like SW-15, too — the all-'round economy . . . the uniformly fine, x-ray quality welds.

Through research A.O. Smith *. . . a better way*

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: MILWAUKEE 1, WIS.

MAIL THIS COUPON TODAY! Get all the facts about SW-15 electrodes and other welding products and services offered by your men from A. O. Smith.

A. O. Smith Corp., Welding Products Div., Milwaukee 1, Wisconsin
More facts please about SW-15 electrodes and other A. O. Smith welding products and services.

Name _____

Firm Name _____

Address _____ Zone _____ State _____

City _____